

ROADS *and* STREETS

HIGHWAYS • BRIDGES • AIR FIELDS • HEAVY CONSTRUCTION

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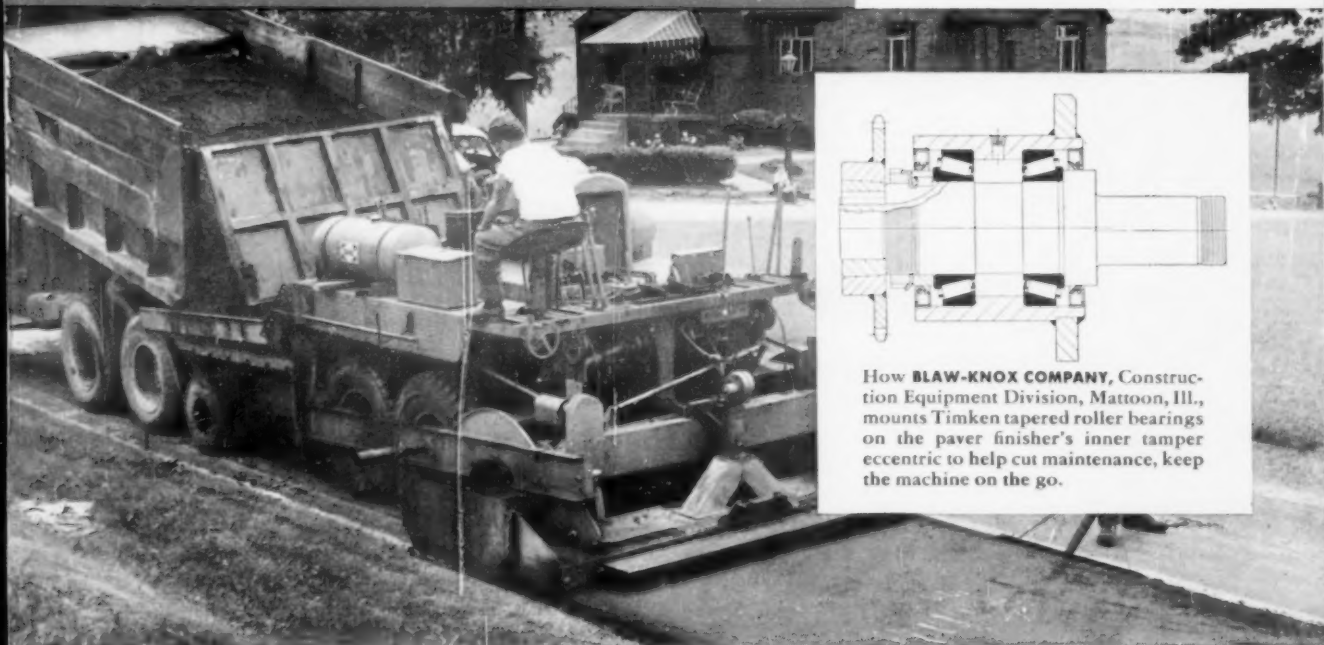
JANUARY 1956

Record Roadbuilding Year
in Review

THREE PAVERS SPEED ROAD JOB

Contents p. 4 — Equipment p. 14

Accepted as Controlled Circulation
Publication at Cedar Rapids, Iowa



How **BLAW-KNOX COMPANY**, Construction Equipment Division, Mattoon, Ill., mounts Timken tapered roller bearings on the paver finisher's inner tamper eccentric to help cut maintenance, keep the machine on the go.

91 TIMKEN[®] bearings help paver finisher lay "black top" faster, cut downtime

THE first rubber-tired paver finisher to have a floating screed combined with a tamper, this 12 1/4-ton Blaw-Knox unit lays 10 tons of black top at speeds up to 55 feet per minute. Shock loads are heavy and constant. To take these destructive loads and prevent costly breakdowns, Blaw-Knox uses 91 Timken[®] tapered roller bearings in these highly important locations: power take-off clutch, transmissions, differential axle, wheels, tamper and tamper drive, conveyor idler, auger drive and control mechanisms.

Timken bearing rollers and races are case-carburized to provide a hard, wear-resistant surface over a tough, shock-resistant core. Because of their tapered construction, Timken bearings take *both* radial and thrust loads in any combination. And full line contact between rollers and races gives Timken bearings extra load-carrying capacity. They keep the machine operating smoothly, minimizing wear and keeping adjacent parts operating at top efficiency. Timken bearings last longer, need less maintenance.

Easy bearing adjustability permits maintaining original clearances. To be sure of the finest bearings, we even make our own steel. We're America's only bearing manufacturer that does. All these advantages are yours when you specify Timken bearings for the machines you buy or build. Look for the trade-mark "Timken" on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".



This symbol on a product means
its bearings are the best.

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS



NOT JUST A BALL NOT JUST A ROLLER THE TIMKEN TAPERED ROLLER
BEARING TAKES RADIAL AND THRUST —LOADS OR ANY COMBINATION

Install Chrysler Industrial Engines

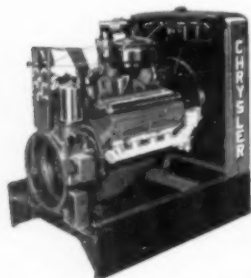
...best-engineered, most-economical answer to your power problem

Chrysler Power is the *dependable*, economical, lightweight answer to your high-speed or high-torque power requirements. Within their power ranges, each Chrysler Industrial Engine is a leader in the field and is recognized as such by manufacturers of almost every type of self-powered equipment.

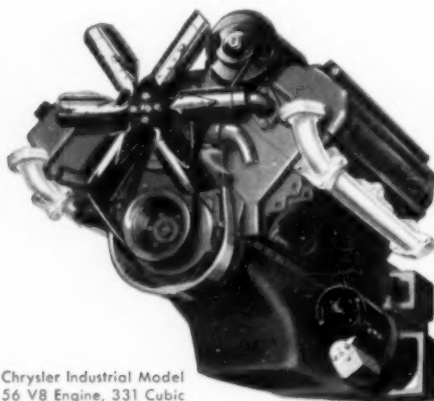
Check the specifications. Note the optional equipment which can be factory supplied or installed to meet the

particular requirements of your equipment in the field. Whether equipped for Gasoline, Distillate Fuel, Propane or Natural Gas operation, Chrysler Industrial Engines offer definite advantages . . . performance, ease of maintenance, fast parts service, low initial and operating costs.

See the dealer nearest you, or write for complete information. **Dept. 101, Industrial Engine Division, Chrysler Corporation, Trenton, Michigan.**



Chrysler Open Power Units. The open power units for all engines include the complete engine, skid base, radiator, instruments and instrument panel, flywheel and flywheel housing. Open power units for V-8 Models Ind. 52 and 56 (pictured), include twenty-five gallon fuel tank.



Chrysler Industrial Model 56 V8 Engine, 331 Cubic Inches Displacement (Front End Chain Drive)



Chrysler Industrial Model 33 Engine, 265 Cubic Inches Displacement (Front End Gear Drive)



Chrysler Enclosed Power Units. The enclosed power units have the complete engine, fuel tank (Models Ind. 30, 31, 32 and 33—sixteen gallon. Models Ind. 52 and 56—twenty-five gallon), storage battery, instruments and instrument panel, flywheel, flywheel housing, skid base and completely enclosing sheet metal.

Optional Equipment—Chrysler Engines

Chrysler Industrial Torque Converter
Chrysler genal Fluid Coupling
Three, Four or Five-Speed Transmission
Twelve or Twenty-four Volt Electrical System
Distillate, Propane or Natural Gas Burning Carburetor
Over-Center Clutch and Power Take-Offs
Vertical or Horizontal Magneto
Flexible Coupling for Truck-Type Flywheel
Radio Shielding and Ignitors
Heavy-Duty Oil Bath Air Cleaners
Safety Switches (Low Oil Pressure, High Water Temperature)
Corrosion or Fungus Resistant Electrical System

GENERAL SPECIFICATIONS

ALL MODELS

	Ind. 30	Ind. 31	Ind. 32	Ind. 33	Ind. 52	Ind. 56
No. of Cylinders	6	6	6	6	8	8
Type of Engine—4 Cycle	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Bore—Inches	3 1/4	3 1/4	3 1/4	3 1/4	3 1/4	3 1/4
Stroke—Inches	4 1/2	4 1/2	4 1/2	4 1/2	3 1/2	3 1/2
Displacement—Cu. in.	230	230	265	265	270	331
Compression Ratio	7.0	7.0	6.8	6.8	7.5	7.5
Valves—Arrangement	L	L	L	L	Vee	Vee
Pistons—No. Rings	4	4	4	4	3	3
Crankshaft—Bearings	4	4	4	4	5	5
Camshaft Drive	Silent Chain	Gear	Silent Chain	Gear	Silent Chain	Silent Chain
Camshaft—Bearings	4	4	4	4	5	5
Crankshaft—Bearing Diameter	2 1/2"	2 1/2"	2 1/2"	2 1/2"	2 3/8"	2 1/2"
Lubrication—Type	Press.	Press.	Press.	Press.	Press.	Press.
Lubrication—Type Oil Pump	Rotor	Rotor	Rotor	Rotor	Rotor	Rotor
Lubrication—Oil Capacity Qts.	5	5	5	5	5	5
Ignition—Battery Type	Yes	Yes	Yes	Yes	Yes	Yes
Spark Plug—Size	14 mm	14 mm	14 mm	14 mm	14 mm	14 mm
Starting—Elec. Type	6 Volt	6 Volt	6 Volt	6 Volt	6 Volt	6 Volt
Gen. Reg.—Full Voltage	45 Amps.	45 Amps.	45 Amps.	45 Amps.	45 Amps.	45 Amps.
Gen. Reg.—Full Voltage and Current Control	Yes	Yes	Yes	Yes	Yes	Yes
Carburetor—Type	Down-Draft	Down-Draft	Down-Draft	Down-Draft	Down-Draft	Down-Draft
Fuel Pump	Yes	Yes	Yes	Yes	Yes	Yes
Weight—Approx. (Lbs.)	575	610	740	760	591	845

Specifications subject to change without notice.

HORSEPOWER



WITH A PEDIGREE

CHRYSLER INDUSTRIAL ENGINES

INDUSTRIAL ENGINE DIVISION • CHRYSLER CORPORATION

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Paving operations near Allentown. Contractor for this section is John H. Swanger, Inc., Lancaster, Pa.

Pennsylvania Turnpike Heads North

The port and industrial facilities of Philadelphia are being linked to the anthracite coal regions and the Pocono Mountain resort sections to the north by the 110-mile-long Northeastern Extension of the Pennsylvania Turnpike.

Beginning at Plymouth Meeting near Philadelphia, the new extension will by-pass major communities and push north to Scranton to a junction of U. S. Routes 6 and 11. Eventually the highway will be extended to the New York State line.

The Northeastern Extension will be a 4-lane limited-access dual highway. Lanes will be 12 ft wide with a 10-in. concrete slab.

Bethlehem, which is well-represented on all sections of the Pennsylvania Turnpike, is supplying dowel units, reinforcing steel, bar mats and other highway steels for the road bed. In addition, Bethlehem structural shapes are being used in the construction of bridges and overpasses, and Bethlehem guard rail will protect motorists and truckers along many miles of the superhighway.



Light-weight, easy-to-handle Bethlehem dowel units are unloaded from truck.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation, Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL



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ROADS AND STREETS

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End earth-mover tube and flap troubles!



All earth-mover and grader types, Wide-Base or Regular
— at same prices as Conventional Tires with tubes!

Latest Goodyear "Firsts"—

TUBELESS TIRES Built with 3-T NYLON CORD plus EASY-MOUNTING TRU-SEAL RIMS

eliminate major causes of down time on all earth-mover and grader vehicles!

If you're wondering whether giant-size tubeless tires can be safely mounted—whether they really *hold* air—whether their savings in cash, time and trouble make them worth-while—GOODYEAR HAS THE PROVED ANSWERS!

Proof one—on actual commercial operations and construction jobs of all kinds, no serious tire or rim trouble has been reported!

Proof galore—unconditionally enthusiastic reports from independent operators add up to this:

NO MORE EXPENSIVE DOWN TIME because of tube and flap trouble!

NO MORE EXPENSIVE TUBE REPLACEMENT—a big factor on many jobs where tires outlast 2 or 3 tubes!

FASTER, EASIER MOUNTING AND DISMOUNTING—no more double inflation, no more tubes and flaps to handle—NO complicated mounting methods to learn!

TRULY AIRTIGHT ASSEMBLY—Goodyear's exclusive 3-T NYLON CORD forms an airtight chamber—and Tru-Seal rims *hermetically seal* the assembly!

COOLER RUNNING than conventional assemblies—means greater safety, longer tire life!

SLOW LEAKS INSTEAD OF BLOWOUTS—small, unnoticed injuries lead to blowouts in conventional tires. In

Goodyear tubeless earth-mover tires, they may be detected and repaired *before* costly, dangerous damage!

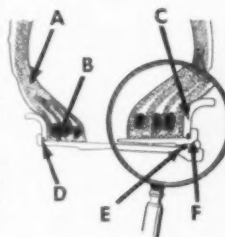
SIMPLER, RE-USABLE VALVE-PARTS—Goodyear's tubeless valve program means fewer parts to stock, lower cost parts that can be used over and over again!

Leading equipment manufacturers are going Goodyear tubeless—with Tru-Seal rims. Specify them in the new wide-base or conventional cross sections and say goodbye to tube and flap troubles forever!

Goodyear, Truck Tire Dept., Akron 16, Ohio.

How Goodyear Engineering assures Quick, Airtight, Tubeless Assemblies:

- (A) 3-T NYLON CORD plies prevent air-seepage through tire.
- (B) Same 5° taper bead-base hugs Tru-Seal rim.
- (C) Tru-Seal rim employs same general mounting principles as conventional rims.
- (D, E, F) Tru-Seal rubber rings press into locking grooves, hermetically seal entire assembly—*automatically!*



Buy and Specify

GOOD YEAR

MORE TONS ARE HAULED
ON GOODYEAR TIRES THAN
ON ANY OTHER KIND!

Look for this sign; there's a
Goodyear dealer near you.

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ROADS AND STREETS, January, 1956

Tru-Seal—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio



Safe, smooth pipelaying on Pittsburgh utilities job—by Cleveland "80W."

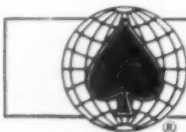


Same job—same day—same "80W"—backfilling and tamping.

PIPELAYING, BACKFILLING and trench compaction, too, where needed—*each* done expertly by the Cleveland "80W." This modern machine substantially reduces equipment and manpower requirements on underground construction jobs of all types. That's why so many users equip *each* of their crews with a versatile "80W." Check its *complete* performance features—see how it fits your program—put it to work for you. You'll be money ahead when you do.

See your local distributor

THE CLEVELAND TRENCHER COMPANY • 20100 St. Clair Ave., Cleveland 17, Ohio



CLEVELAND

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ROADS AND STREETS

Devoted to the design, construction, maintenance and operation of highways, streets, bridges, bridge foundations and grade separations; the construction and maintenance of airports. Represents 63 years of continuous publishing in the highway field; combined with Engineering and Contracting and Good Roads Magazines, established in 1892.

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"They move plenty of dirt

...and they have
that **CAT***
dependability"



A county road south of Bloomington, Kansas, had to be straightened. Fill for the job—some 70,000 yards of clay and loam—were to come from changing Kill Creek's channel ... a big assignment that called for fast-stepping heavy-duty machines. G. W. Christolear, of Heide & Christolear Construction Co., Smith Center, Kansas, says, "We looked the earthmoving equipment field over, watched all makes of rubber-tired machines, talked to the owners, and settled on Caterpillar DW15s. The fact that they move plenty of dirt and have that Cat dependability convinced us."

The DW15s on this job haul heaped loads in their No. 15 Scrapers, making an 800-yard round trip in just over four minutes. They go ten hours a day on only 35 gallons of fuel.

These 186 HP four-wheeled workhorses are designed and built for tough, fast, economical work. They offer ten forward speeds to 24 m.p.h.—to 31.3 m.p.h. with optional gears. They perform especially well in narrow, confined

areas. And they work smoothly with a complete line of matched units—with scrapers, and with bottom dump and side dump wagons.

But only a real demonstration can show you the DW15's advantages. Call your Caterpillar Dealer today. And remember, he's always handy with competent service and factory parts—parts you can trust.

Caterpillar Tractor Co., Peoria, Illinois, U.S.A.

CATERPILLAR*

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**NAME THE DATE...
YOUR DEALER
WILL DEMONSTRATE**

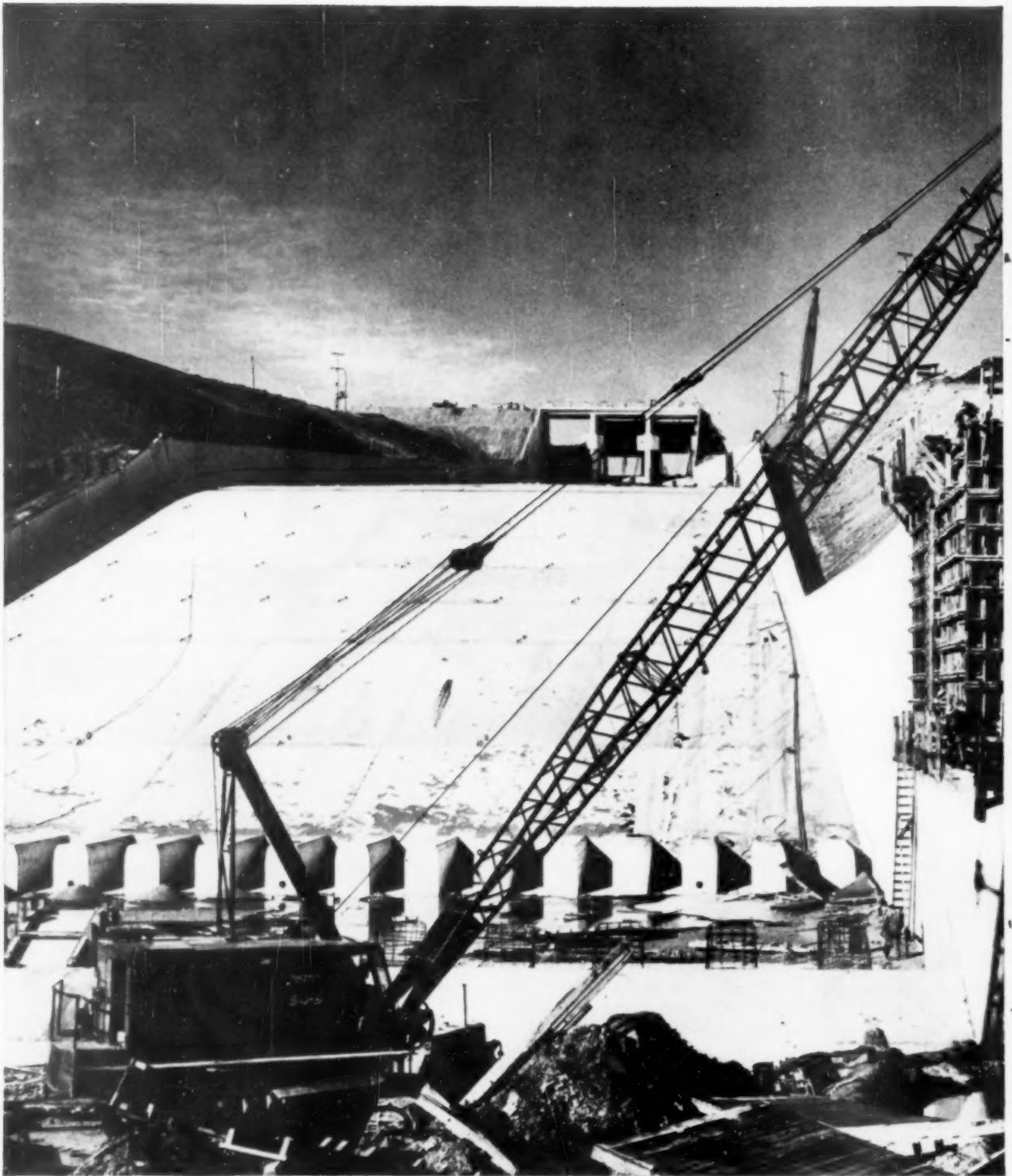
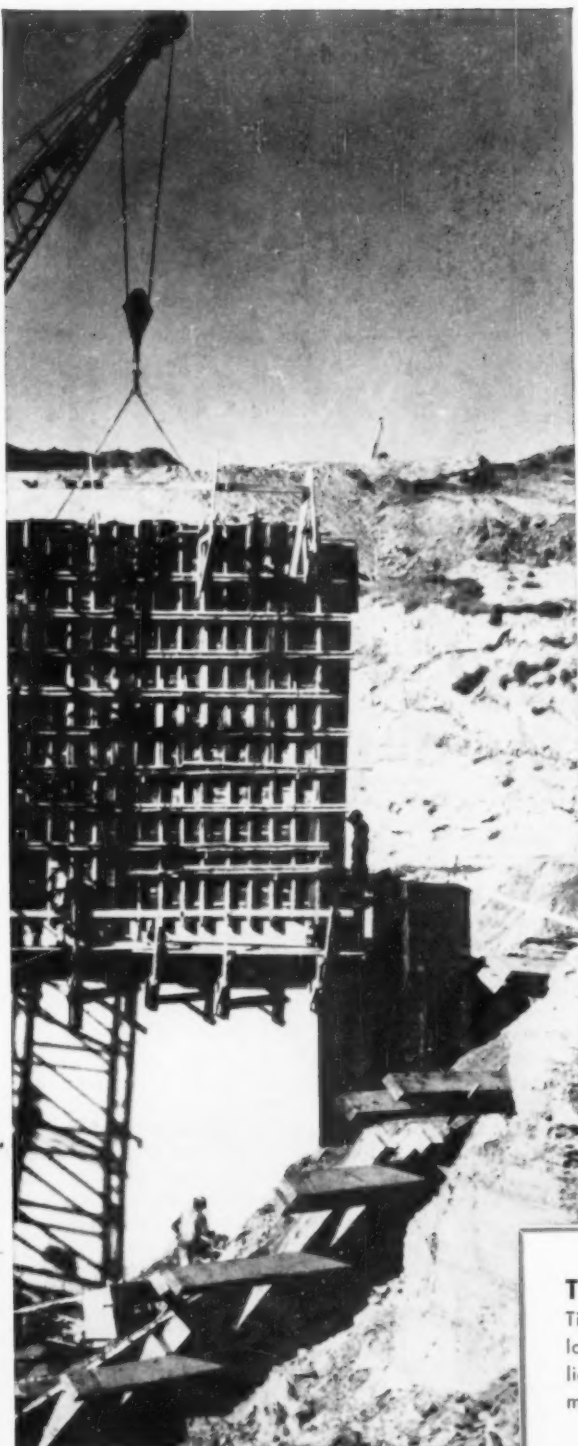


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TEXACO STAR THEATER
 starring
JIMMY DURANTE
 on TV Saturday nights.
METROPOLITAN OPERA
 radio broadcasts
 Saturday afternoons.



TEXACO



How Texaco helps beat schedules

JAMES & WUNDERLICH, contractors, handle all construction work at Tiber Dam, Montana. To keep their huge task force of equipment operating dependably and economically, they rely on Texaco for all lubrication. Reports Mr. F. A. Bleecker, Project Superintendent:

"To keep our equipment on the job constantly, we need really effective lubrication—and get it with Texaco. Our diesels, for example, deliver top-notch performance with *Texaco Ursa Oil Heavy Duty*. In addition, we've improved preventive maintenance procedures and cut costs by following the Simplified Lubrication Plan recommended to us by a Texaco Lubrication Engineer. Thanks to Texaco, we get the high equipment efficiency necessary to keep the work ahead of schedule."

Before you start your next project, ask a Texaco Lubrication Engineer about the Texaco Simplified Lubrication Plan. He'll show you how — with *no more than six Texaco Lubricants* — you can handle *all* major lubrication, save time and money, eliminate errors.

Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, New York.

TIBER DAM, crossing the Marias River Valley 13 miles below Tiber in Northwest Montana, will be 205 feet high and 4,300 feet long when completed. Guy H. James Construction Co. and Wunderlich Contracting Co., contractors for the project, lubricate their equipment with Texaco exclusively.

Lubricants and Fuels

FOR ALL CONTRACTORS' EQUIPMENT

Select Earth Compaction Equipment Wisely

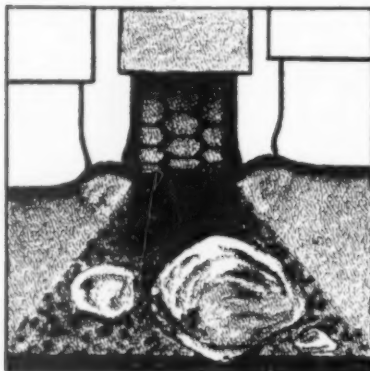
The right equipment assures a job well done at low cost.

Nothing is more important in compacting an earth fill than the proper selection of equipment well chosen; the right equipment produces modern density requirements of the engineer at relatively low cost to the contractor. In a few jobs, it is true, the earth can be used uncompacted. In others, the sheepfoot roller has a definite place; however, on the highest-type fills, the heavy duty rubber-tired compaction roller has demonstrated its outstanding ability to densify heavier lifts with fewer passes than any other equipment. In fact, the development of pneumatic rolling in the past 12 years has made it possible to build fills faster and far better than ever before.

That is why, in our mind, the heavy rubber-tired pneumatic compaction roller represents the greatest contribution to soil compaction in recent years. In 1932, contractors began to notice that loaded scrapers, far heavier than the "sheepfoot tamps" then in use, delivered high compaction in the area under the tires. The modern pneumatic compactor sprang from this basic observation.

COMPARING METHODS

The first direct comparison between the two types of rolling was made at Isabella Dam, Calif.: 42,000-pound



Southwest Rollers compact lifts 24" thick permitting rocks, cobbles to be incorporated in fill without removal.

sheepfoot rollers were used on the first dirt contract; pneumatics with 20,000 pounds of weight per wheel and 80 psi tire pressure on the second job. Twelve sheepfoot roller passes were made on 12-inch lifts on the first job. On the second contract, a Southwest C-50 Compactor made 6 passes on 18-inch lifts. In both cases, 70% of



Fill compaction achieved by sheepfoot roller and Southwest compaction roller. The substructure is 975 feet long and 95 feet from bedrock.

the tests went over 94% of Modified AASHO density. On this job, incidentally, a Southwest Giant Ripper was used for the first time to loosen and pre-wet the borrow pit.

Later, pneumatics also proved their ability where water was scarce—in dry desert sand on 2-inch lifts, they gave a fair degree of compaction under conditions considered almost impossible.

Because the Southwest Compaction Rollers generally will handle thicker lifts than a sheepfoot, rocks or cobbles can usually be incorporated into the fill without undergoing the expense of their removal. They will also compact a fill at a higher moisture content than a sheepfoot roller. The ponderous weight of their heavily loaded pneumatic tires overcomes pore pressures in the soil, squeezing some of the excess water up to the surface where it can evaporate. Furthermore, tests have shown that such a pneumatic-rolled fill has unusually good ability to shed rain water.

Engineers and construction authorities have concluded from tests that most earth-fills can be compacted by heavily loaded rubber-tired compaction rollers with about half the number of passes and for about half the cost of comparable results with the sheepfoot.

OBSOLETE SPECIFICATIONS

The truth is that the superior performance of pneumatic rollers such as built by Southwest has made many specifications obsolete—specs which call for one roller for each 150 cubic yards of fill per hour hauled in. South-

west Compaction Rollers can handle considerably larger amounts.

For a really high-type compaction job, compaction equipment needs weight, and it should be adaptable to a wide range of tractors. If pneumatic, its wheels should deliver the same constant load pressure regardless of ground contour. It should have full-oscillating weight boxes, so that there is absolutely no bridging or shifting of load. Weight boxes and tire pressure should offer the utmost flexibility. Standard 4-section units should be built so that they can be quickly converted to 3, 5, or 6-unit rollers in a minimum of time.

The unit should be able to compact 12-inch lifts with the same ease that 6-inch lifts were compacted, preferably in from 4 to 6 passes, and at greater speed than has ever been possible before. The ever-increasing density and CBR requirements on 1956 model fills make it necessary to use the finest modern processing and compaction equipment to get a good job done swiftly, and at a profit.

WRITE TODAY!

For illustrated folders on the finest compaction roller equipment developed to date.

SOUTHWEST WELDING & MANUFACTURING CO.

*Construction Machinery Division
ALHAMBRA, CALIFORNIA*

Need 400 tons of 1¼" aggregate per hour, with crushing 20%?

... 250 tons per hour of paving stone?

... 300 tons per hour of crusher run limestone?

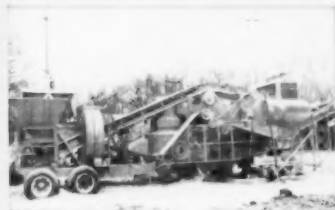
CEDARAPIDS has the answer



The Commander, big-volume producer of fine crushed aggregate, is the answer to profitable operation in pits with high percentages of fines. Maintenance costs are low.



Portable Primaries turn 100% of pit run material—even big boulders—into specification product. Use ahead of any make gravel plant for profitable rock crushing.



Cone Crusher Secondary combines Cedarapids portability with Symons® Cone Crusher's low-cost output of the hardest or most abrasive rock or gravel.



Single Pass Plants for low-cost crushing units where material does not have to be accurately graded, and for jobs where portability and fast set-up are important.



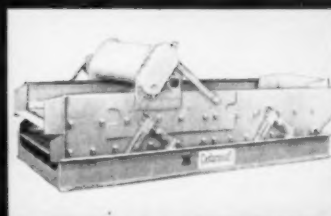
Hammermill Secondary Plant, a complete gravel crushing and screening plant, produces roadrock or aglime or a percentage of both at the same time.



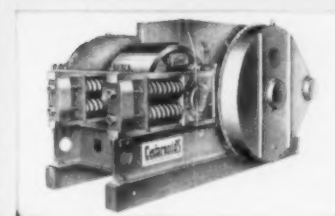
Portable Double Impeller Impact Breakers are ideal primary units for use ahead of secondary crushing plants. Use alone for high capacities of desirable cubical shaped aggregate.



Jaw Crushers—15 sizes enable Cedarapids engineers to select the right size for your job. Single jaw and twin jaw models are available.



Horizontal Vibrating Screens in a wide range of sizes in single, double and triple deck models, assure high capacities of accurately graded aggregate.



Roll Crushers, in eight sizes with three types of roll shells, insure high capacity of the smaller sized finished products you want.

IOWA
MANUFACTURING COMPANY

Cedar Rapids, Iowa, U. S. A.

IOWA MANUFACTURING COMPANY, Cedar Rapids, Iowa, U. S. A.
Gentlemen: My next job is _____

☐ Please send details of the Cedarapids equipment you recommend.

Name _____

Title _____

Company _____

Address _____

City _____ Zone _____ State _____

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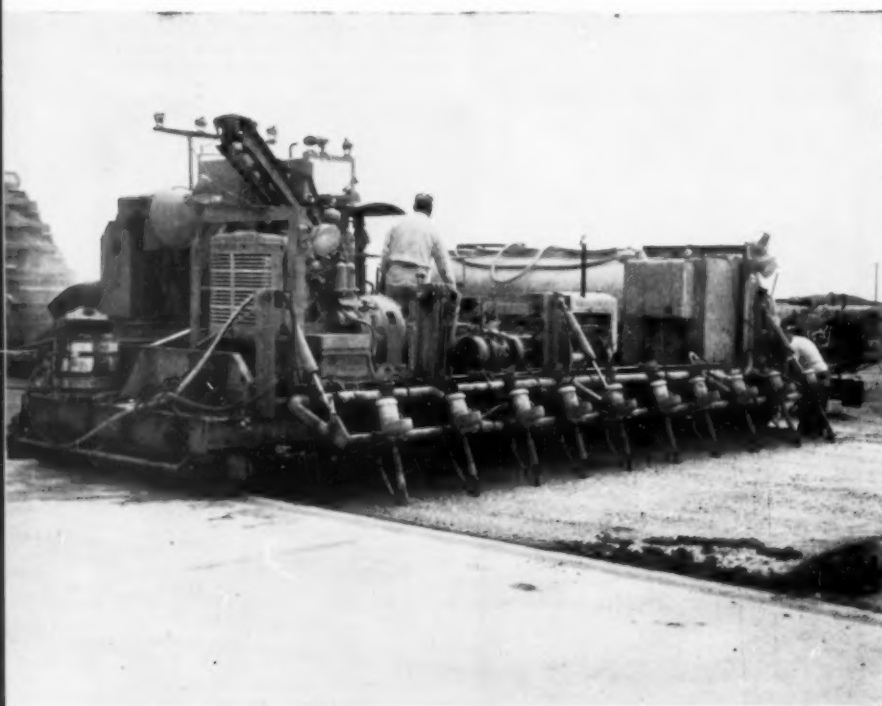
ROADS AND STREETS, January, 1956

A PICTURE REPORT OF

INTERNATIONAL POWER

Boosting job production everywhere

Morrison-Knudsen Co. and **Landers & Griffin Inc.**, joint venturers on \$17,000,000 Portsmouth (New Hampshire) Air Base, are laying 423,000 cu. yds. of concrete with this spreader. Its 10 International-powered vibrators continuously work a strip 25 ft. wide, 14 inches thick. All concrete is being laid for 200 x 11,620 ft. runway and 1,000 x 8,500 ft. apron. Also on the 5,788,000-yd. job are 6 TD-24 torque converter pushers and 16 self-propelled scrapers. Their output on 10,000-ft. cycles averages 1,400 pay yds. hourly.



This International "300" tractor is economically doing a job normally assigned a much bigger, more expensive machine... moving 1000 cu. yds. Heaping 8 cu. ft. of sandy loam per load, it completes a 100-ft. cycle every 1½ minutes. "300" is building a running track for a school in Greenville, Mississippi, will take 7 to 10 days.

3000-ft. cycle every 3 min. is the record of Western Construction Co's "55" Payscraper. This includes time for TD-24 to push-load 10 pay yds. of ripped caliche. Area, near El Paso, Texas, was once considered too steep and rocky for development. Soon, thanks to International power, it will be graded and terraced for 250 quarter-acre lots.

WHAT'S NEW in Equipment and Materials



"Ideal for dozing rock," says Paul Weaver, Supt. for Joe Wenke Quarries, of this veteran TD-14A. "We use it continuously for shovel and quarry-floor cleanup. Performance has been excellent. Downtime is way down, due partly to rugged construction, partly

to prompt parts delivery service from our International distributor." Quarry, located at Toledo, Iowa, produces 200 tons of 1-inch road stone per hour.



Fast on job, fast between jobs—Handling all tractor work in a quarry near Denver, Colorado, 200 hp TD-24 saves time by driving job-to-job at 7.8 mph. Output, 2200 tons of 1¼-inch stone per 8-hour shift, is taken from crusher by International-powered belt conveyor, background, then stockpiled by TD-24. Unit also does all stripping.



Ripping 150 yds. of concrete in front of a Camden (New Jersey) filling station was a job too tough for a ¾-yd. shovel, according to engineers. Al Pangia's International Drott TD-14A, however, did the work unassisted. Unit's tremendous break-out force, 17,000 lbs, broke up the slab... even tore out 5-ft. concrete footings.

International

makes every load a pay load



Industrial Power

A machine size for every job... see your nearest INTERNATIONAL DISTRIBUTOR for details.



PAYSCHAPERS
13 yds. and 18½ yds.



CRAWLER TRACTORS
8 Models... 40 to 200 hp.



DIESEL, GAS ENGINE
18 Models... 16½ to 200 hp.



WHEEL TRACTORS
6 Models... 9 to 59 dhp.

ALSO: International Drott Loaders... International Scrapers, Bottom-Dump Wagons... and International Superior Pipe-Beam Tractors.

WHAT'S NEW in Equipment and Materials

Hoist for Truck Bodies

New lighter weight, extreme forward location and point-of-lift of the new "Telaramic" hoist of Anthony Co., Streator, Ill., shifts all of the hoist weight way up front. Gives greater front axle load distribution and larger legal payload on the rear axles. Anthony "Telaramic" hoists feature "Ring Trussed" cylinders which use external reinforcement rings on the over-lapping ends of each cylinder tube to prevent "flaring." Keeps cylinder sections from bending, buckling or bulging. Makes packing last longer — adjustment quick and easy. Body shown in illustration is material haulers special lightweight FL 6 "Head Lift" body, 8-10 cu. yd. capacity. High tensile steel gives unit weight under 3,000 lb. Single and twin telescopic hoists are available in 8 to 25 ton capacities under dump bodies of 8 to 18 ft. lengths.

For more information circle 101 on Service Coupon this page and mail now.

Combination Cement Box Batchboard

A new combination cement batchboard, announced by The Heltzel Steel Form & Iron Co., Warren, Ohio, is designed to give fast, completely trouble-free operation on any size truck. The batch box is fastened to the truck bed by four bolts and can be mounted with minimum effort on the part of the contractor.

The large capacity box — 13½ cu. ft. — will handle cement for 34-E paver with a 10 percent overload. The cement box is sealed with the batchboard so no moisture or aggregate will come in contact with the cement in the box. When the batchboard is tripped, the cement is dumped on top of the aggregate and flows into the paver skip in a manner stated to prevent cement loss due to adhesion to the bottom of the skip. The batchboard is tripped by means of a 5 lb. pull on a handy lever. The total movement is 10 degrees. The boxes and batchboards can be moved from a truck by merely loosening four bolts and the truck can be used for other type work.

For more information circle 102 on Service Coupon this page and mail now.

Plastic Covers for Cement Trucks

Dome-Shaped lids for truck trailers used for hauling cement are being made from lightweight reinforced plastic by Commercial Plastics Co., Santa Ana, Calif. The 3-ft. high domes, 11 ft. long by 8 ft. wide, are molded in one piece from glass fibers and Vibrin polyester plastic made by the Naugatuck Chemical division, United States Rubber Co. They weigh only 150 lb., and won't rust, shatter or warp. They are replacing riveted aluminum lids on the trailers because they won't leak air or cement. In addition, moisture won't form on reinforced plastic. About 50 trailers equipped with the new domes are now in use. They have

been installed on double-trailer diesel units made by Trailmobile, Inc., and are operated on the West Coast. Some of the plastic-topped trailers have already piled up 50,000 miles without any repairs being needed on the domes.

For more information circle 103 on Service Coupon this page and mail now.

Wire Rope Straightener

A machine for straightening wire rope has been placed on the market by Cable Strete Co., 345 Arbor Road, Melrose Park, Calif. The machine is portable and operated by one man. It removes bends, twists, loops and kinks from all sizes of rope. Length of rope and eyes present no difficulties.

For more information circle 104 on Service Coupon this page and mail now.

More equipment news page 112

Sprayer For Weed Control and Miscellaneous Use

Portable spraying equipment designed for weed control, insect control, building maintenance and other work has been announced by Larson Machine Co., Princeville, Ill., manufacturers of commercial and farm sprayer systems.

The unit comes in two sizes: one with a 3-h.p. gasoline engine driving a high speed nylon roller pump to develop 150 lb. pressure; the larger 3½-h.p. engine develops 300 lb. pressure.

For more information circle 105 on Service Coupon this page and mail now.

Joint Sealing Compound

A new joint sealing product, for use around concrete paved airports, refineries and bulk plants, has been announced by Keystone Asphalt Products Co., Division of American — Marietta Co., 101 East Ontario St., Chicago 11, Ill. Called Jetseal Joint Sealer, this non-asphaltic compound is highly resistant to jet fuel and engine cleaning compounds. It is recommended for application wherever those solutions, or any other petroleum derivatives, might be spilled. Jetseal Joint Sealer is claimed to offer lasting protection against damage caused by the infiltration of water and other foreign substances, and to maintain positive bond with the concrete throughout complete cycles of extreme cold and heat. It conforms to interim Fed. Spec. SS-S-00167 and SS-S-164 — modified for jet fuel.

For more information circle 106 on Service Coupon this page and mail now.

For more items . . . see page 112

MAIL THIS COUPON TODAY!

ROADS & STREETS
22 West Maple Street
Chicago 10, Illinois

**CIRCLE THE
NUMBERS
AND MAIL NOW!**

Please send me further information on products and materials mentioned in the January Roads & Streets as circled below

About New Equipment and Literature:

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NOT GOOD AFTER FEBRUARY 15, 1956

A READER SERVICE FOR YOUR NEEDS



HOW MOBILE **CAT*** POWER PAYS OFF FOR LAMBERT BROS., INC.



A D397 Mobile Electric Set provides crusher power on a job for Lambert Bros., Inc., near Greenback, Tennessee. The 315 KW D397, Caterpillar's biggest trailer-mounted electric set, is well within highway weight and size restrictions.

When Lambert Bros., Inc., Knoxville, Tennessee, received the contract to furnish 26,000 tons of base material for road construction near Greenback, it set up the operation pictured here. The company provided its own power with this Cat D397 Mobile Electric Set. The 315 KW unit provided the power to run the Cedarapids crusher, working 8 hours a day, 5 days a week. Output averaged about 900 tons a day. Said Lambert's Ben L. Greene: "I like the D397 because it gives us a maximum amount of operation with a minimum amount of maintenance."

For dependable electric power, *when* it's needed and *where* it's needed, you can't beat Caterpillar Electric Sets. They're available in a complete range of sizes, up to 315 KW, for use in emergency or full-time operation. Each is a complete unit, mounted on skids, semi-trailer or trailer. Easy to hook up and easy to op-

... for more details circle 258, page 14

erate, they deliver steady voltage. There's one that fits your needs and—as Mr. Greene points out—provides maximum performance with minimum maintenance.

Wherever you move these sets, you always have the plus of prompt service, right on the spot, from your nearby Caterpillar Dealer. For complete information about these versatile power plants, see him soon.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR*

*Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

**MODERN, HEAVY-DUTY
PORTABLE ELECTRIC POWER**

LOOK AT REO

122,000 MILES ... then only a valve grind!



TRUCKS, BUSES AND GOLD COMET ENGINES FOR ORIGINAL

**Mr. Lynn A. Schloss, Vice President,
Ransome Company, Emeryville,
Cal., reports on Reo model F-22R:**

"We brought this unit into our shop when it had put on approximately 122,000 miles. We removed the head and found that all that was necessary was a valve grind. Now, some six months later, the unit has needed no further attention."

122,000 miles is actually small measure of the work performed by this Reo Gold Comet. It doesn't take into consideration the hours

of work operating power take-offs, towing equipment and idling at hot, dusty, construction sites.

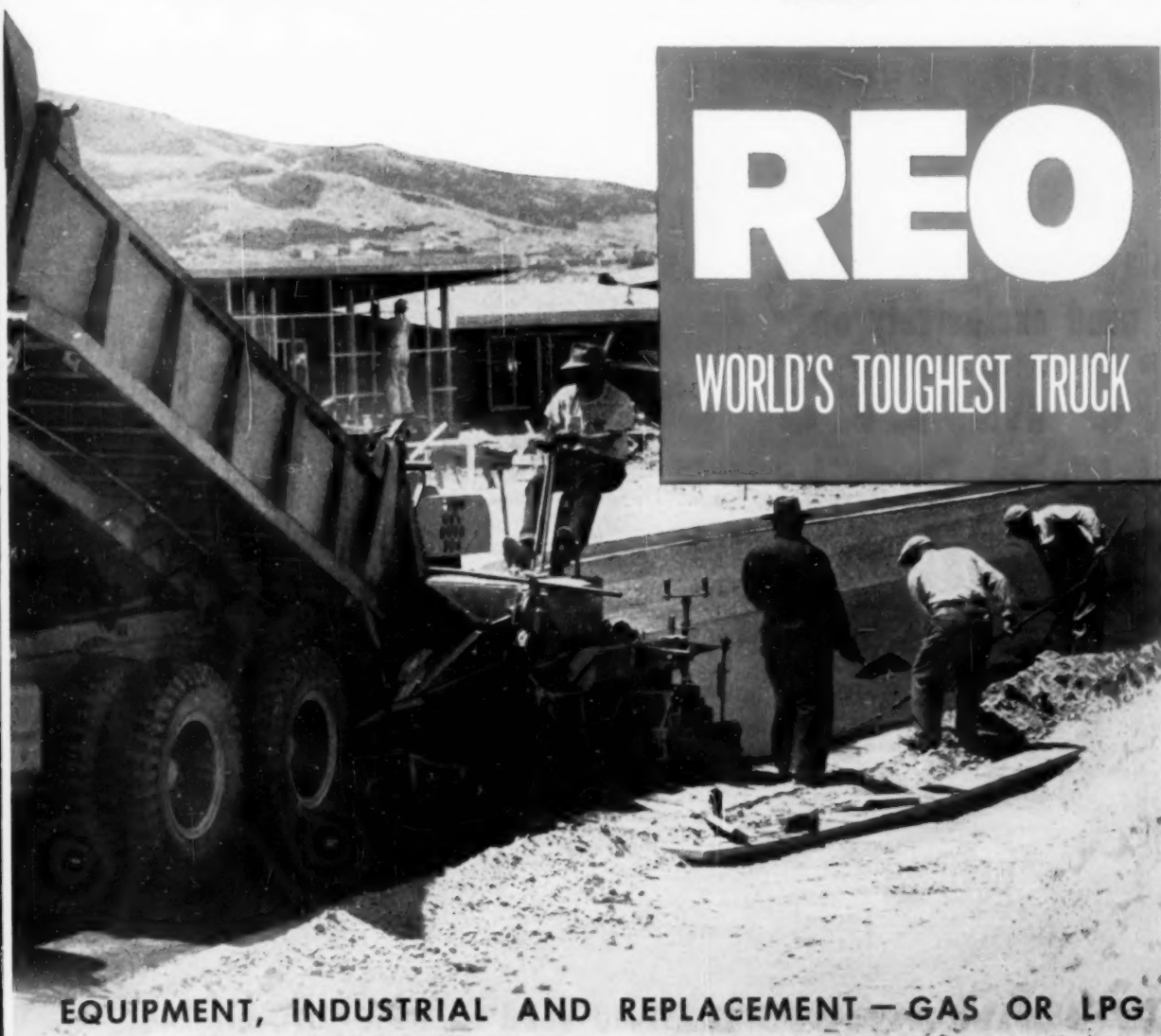
Your assurance that Reo, *the World's Toughest Truck*, will perform like this on your job is the famous Reo 100,000 mile or 1 year warranty on all Gold Comet engines. Call your Reo Factory Branch or Distributor and look at Reo before you buy your next truck.

REO MOTORS, INC.

LANSING 20, MICHIGAN

• TORONTO, ONTARIO

SUBSIDIARY OF **BOHN** ALUMINUM & BRASS CORPORATION



REO

WORLD'S TOUGHEST TRUCK

EQUIPMENT, INDUSTRIAL AND REPLACEMENT — GAS OR LPG

... for more details circle 256, page 14
ROADS AND STREETS, January, 1956



**Blaw-Knox Base Pavers
used exclusively on
63 MILES
of Maine Turnpike
4-Lane Extension**

spread up to 400 tons per hour of base material

All of the paving on the 63-mile, 4-lane Maine Turnpike was laid over base material spread by Blaw-Knox Base Pavers.

These high capacity Model P-150 Base Pavers were used by both major paving contractors to spread the base material to a 4-inch depth on the two 24-foot wide strips on this job.

The big capacity of the Model P-150 keeps any paving job rolling. Oscillating V-type screed assures "straightedge" leveling of large stone, slag, gravel, soil cement or crusher run aggregate to close specification *without segregation*. Oscillating action tends to knit adjacent courses eliminating uneven joints and the need for hand leveling. It will lay base material up to 16 feet wide and up to 20 inches deep and is easily adjusted for crown and superelevated curves. The 21-inch tracks provide ample traction for pushing loaded trucks in soft material without disturbing the base material.



BLAW-KNOX COMPANY, Mattoon, Illinois
Construction Equipment Division

... for more details circle 185, page 14

ROADS AND STREETS

Sixty-Three Years of Editorial Leadership

Washington News Letter



By Duane L. Cronk

January 10, 1956

The first real action on highway legislation by the new session of Congress is expected to break this month. The next few days should indicate whether America will get the long-range roadbuilding program it so sorely needs or a watered-down federal-aid proposition.

Leaders in both parties have promised to give priority attention to road bills. Some bills are already in the making, including one by George Fallon, chairman of the House Subcommittee on Roads. It was Congressman Fallon's pay-as-you-go proposal (concentrating taxes on the truckers) that was steam-rolled in the last session along with the Administration's bond-financed "grand plan."

* * *

Pay-as-you-go advocates will not risk incurring the wrath of the trucking interests again. New bills will probably provide "across-the-board" measures, such as a one-cent increase in the federal gasoline tax. To soften the blow, the program reportedly will be cut down and spread over a longer period, perhaps 12 or 15 years.

Financing of the controversial National Interstate System may be segregated also, so it can be jettisoned if the going gets rough. The NIS was the heart of Eisenhower's original proposal, but carving down the "grand plan" is expected to be the order of the day, as Congressmen strive to create a pay-as-you-go plan that will not make anyone pay too much.

* * *

The major reason for such retrenchment is that the only word Congressmen received on highway legislation during the last session was from interests adversely affected. The mail was 1,000 to 1 against the highway proposals. The memory lingers.

The only thing that could assure passage of a multi-billion-dollar road program on the scale so hopefully proposed by President Eisenhower would be an outburst of public demand. The National Highway Program needs a personal advocate to the people. This year, a 30-second appeal by Arthur Godfrey would probably do more good than all the testimony of all the highway interests in Washington. The climate here could be changed overnight if some one crusader with a popular following were to wake up screaming about the 1,000 traffic deaths on American highways over the holidays, many of them directly attributable to dangerous, congested roads.

(continued on next page)

Politics killed the "grand plan" last year, they say. But, there are two sides to every coin. Politics has built thousands of miles of highways throughout the states. "Good roads" programs have elected governors for years. Politics can start the whole country out of its traffic jam. This is an election year. Why not make the most of it!

The challenge couldn't be better stated than it was in a Collier's editorial January 6:

"Congress is not insensitive to the view of the man in the street, the man who will go to the polls in November. But the voice of the public was still last year.

"If that voice remains still this year, the prospect of a highway program will be dim, indeed. If the people speak up, the highway program is a cinch.

"It's as simple as that."

* * *

Meanwhile, the growing pressure on the nation's already heavily loaded traffic lanes can be measured in production figures coming out of Detroit. More than 8 million vehicles were turned out in 1955. And automobile sources have predicted that production during the first six months of 1956 will be at the rate of 9 million vehicles per year.

"Nearly four times as many lane-miles of vehicles were produced during the last 10 years as highways for their movement," Pyke Johnson of the Automotive Safety Foundation reported last month.

Automobile leaders are well aware that congestion is reducing the utility of their product, especially in urban areas. Auto-mobility is fast disappearing in literally dozens of cities where construction has failed to keep pace with traffic growth.

* * *

Some 406-or 93%- of the nation's 435 Congressional districts would be traversed or touched by routes of the proposed National Interstate System, the National Highway Users Conference has determined. NHUC offers the finding to offset any argument that the System would benefit only a few.

* * *

The highway industry will be primed and ready by next month to answer Congressional queries about contractor capacity to handle an enlarged highway program. The American Road Builders Association sent out a questionnaire last week to 6,000 contractors in search of the needed information. Other ARBA task forces are bringing up-to-date the reports which were so influential last year in easing the doubt that roadbuilders and suppliers would handle more work. The 1955 survey, which brought replies from more than 5,000 contractors, indicated that they could carry twice as heavy a construction load.

Make Yours an Austin-Western in '56



BUILT TO OUTPERFORM

The unequalled performance standard of each Austin-Western product is the result of advanced engineering skill teamed with years of manufacturing know-how.

To be sure —

There is no substitute for Austin-Western quality.

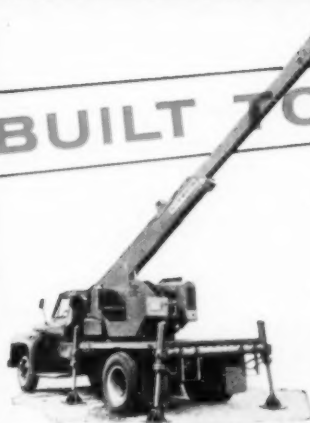
There is no substitute for Austin-Western performance.



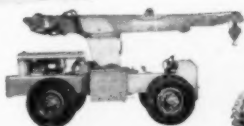
Model "40" Motor Sweeper



Tandem Roller



Truck-Mounted Hydraulic Crane



Self-Propelled Hydraulic Crane



4x4 Power Graders (88-L and 99-L)



6x6 Power Graders (Super 88 and Super 99)



3-Wheeled Roller

Austin-Western

Power Graders • Motor Sweepers
Road Rollers • Hydraulic Cranes



Construction Equipment Division

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CONSTRUCTION EQUIPMENT DIVISION
Baldwin-Lima-Hamilton Corporation
AURORA, ILLINOIS, U.S.A.

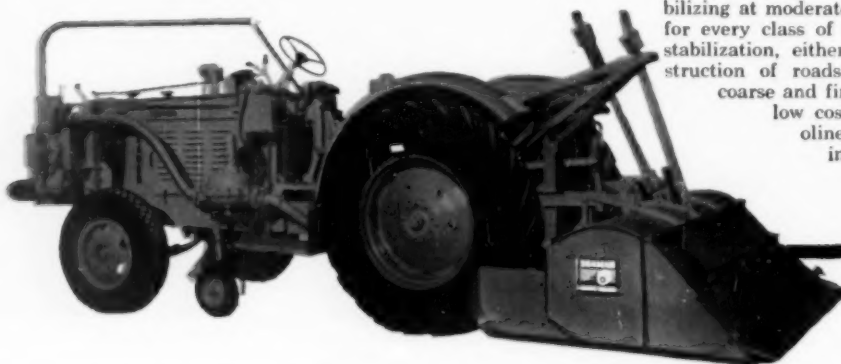
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Announcing New Complete

S-A

SA Modern Stä-Bilt Method of Road Stabilization

SEAMAN TRAV-L-PLANT and PULVI-MIXER build better road bases through faster, more thorough, accurately controlled in-place mixing — a normal production rate of up to A MILE A DAY of 22-foot road! Exclusive advantages include: Mixing for *all* types of stabilization including bituminous, soil-cement, gravel, or chloride, both sodium and calcium. Blending and properly placing aggregates and fines for more durable, higher loadbearing bases. Completely correcting aggregate segregation. Mixing, blending and finishing to final grade, partially pre-compacted ready for final rolling.



SA SEAMAN SELF-PROPELLED TRAV-L-PLANT

Designed for highly accurate application of all binders, including water and bitumen, simultaneously with mixing operations. Equipped with pump, spray bar, tachometer assemblies, volumetric meter. All operating controls within quick easy reach. A perfect, *all-process* machine for economical mix-in-place operations. 7-foot mixing width, gasoline or Diesel powered.

SA SEAMAN SELF-PROPELLED PULVI-MIXER

The stabilization "workhorse" for all types of stabilizing at moderate investment. Widely accepted for every class of mixing and processing of soil stabilization, either new construction or re-construction of roads. Delivers accurate blend of coarse and fine aggregate — for all-weather, low cost, long-wearing surfaces. Gasoline or Diesel powered. 7-foot mixing width.

SA COMPACTOR SELF-PROPELLED, PNEUMATIC

New SEAMAN-ANDWALL Portable and Self-Propelled Rollers and Compactors offer many new advantages in road building . . . Greater visibility and maneuverability, easier transport to the job, plus many new features that assure superior compaction, more accurate rolling — without surface shear, scuffing, or material displacement. Choice of models for every type of operation, every contractor.

Revolutionary new design in heavy duty rubber tire rollers. Self-propelled for transport road speeds up to 20 m.p.h. Provides new "straight down" pressures . . . eliminates usual pushing action, surface shear, scuffing, material displacement. Power steering — full 180° turn on 20-foot road beds. Four 500-gal. Liquid Ballast Compartments — 5 Ton — 15 Ton — 20 Ton —



See your S-A Distributor —

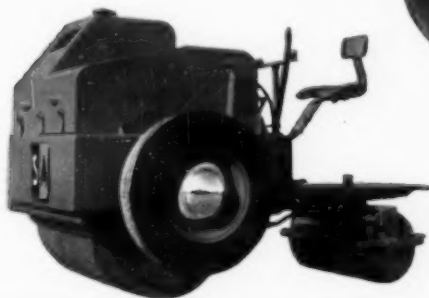
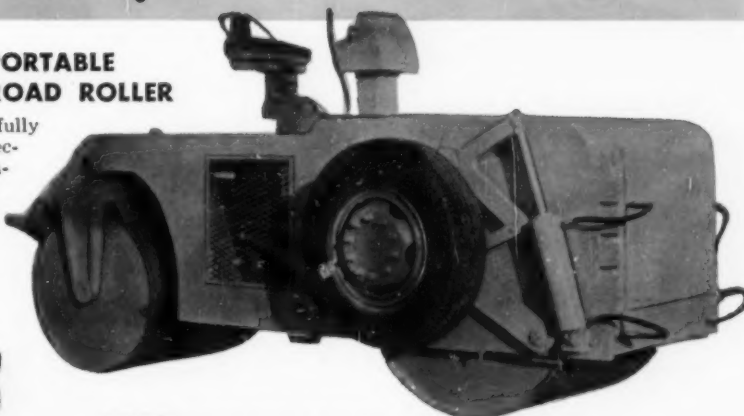
Open the way to **BETTER ROADS...at lower cost!**

Stā-Bilt Line

for Road Construction

SA SEAMAN-ANDWALL PORTABLE 7-10 TON TANDEM ROAD ROLLER

The first portable 10-ton Roller that is fully automatic, can be made portable in 90 seconds, and provides easy one-man operation. Equipped with 61 H.P. engine, fuel-saving TURBO-TORQUE drive. Hydraulically lowered trailing wheels are hinged and removable for rolling close to vertical obstruction.



SA SEAMAN-ANDWALL PORTABLE TANDEM 2-3 TON ROLLER

Highly maneuverable, compact, versatile, "one-man" Roller, designed for a wide variety of jobs. Gasoline powered, with compaction roll designed for liquid ballast. Hydraulically lowered pneumatic tired wheels for easy trailing and transport. Wheels removable for close-up rolling to avoid hand work.

SA SEAMAN-ANDWALL SPREADERS For Superior Efficiency in Spreading All Materials ... Cement, Sand, Salt, Cinders, Gravel

There's a SEAMAN-ANDWALL Spreader for every need, in models and sizes to fit every road-building budget. Each one has unique advantages and features to meet specific requirements—in all types of materials, in daily production, and in accuracy of volume and placement.

SA HERCULES CEMENT SPREADER

Heavy duty spreader for soil-cement paving. Auto-type differential provides efficient transfer of power, hand-lever controlled. Has strike-off bars for accurate quantity control up to 10-foot width. Dual Pneumatic tires for traction. Easy to attach, requires no special tail gate.



SA CENTURY CEMENT SPREADER

A new idea in spreader design, providing absolute accuracy in cement spreading. Positive volumetric control of cement governed by free-running tachometer wheel which cannot skid or slow down. One-man remote operation from truck cab.



SA CENTURY MATERIALS SPREADER

The SA Century "Posi-Feed" Model HY-4 . . . Demountable tray for seal coating can be replaced with spinner for spreading sand or chlorides. Vibratory mechanism in the truck body maintains steady movement of materials to avoid uneven distribution. Eliminates hand feeding from truck body. One man operation.



SA

Write for Bulletin

**TODAY'S HIGHEST STANDARD OF
EFFICIENCY AND ECONOMY IN
MODERN ROAD BUILDING...**

**SEAMAN-ANDWALL
CORPORATION**

291 North 25th Street, Milwaukee 1, Wis.

... for more details circle 225, page 14

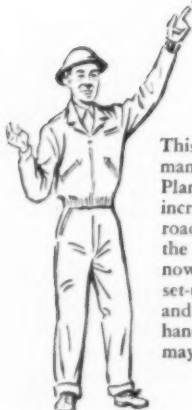
ROADS AND STREETS, January, 1956



You Can Bid any Road Job Successfully with this One-Man Operated Plant

With the completely automatic new BUTLER 0-1-0 only one man is needed to batch sand, cement and two sizes of stone at a rate that easily keeps abreast of two 34E dual-drum pavers.

Controls for any specified concrete proportions are pre-set. Until the specifications change, complete batching is achieved at the touch of push buttons . . . Savings in man power, time and costs are correspondingly great.



This development of the BUTLER one-man operated Automatic Roadbuilders Plant is a logical answer to the enormous increase in highway construction. The roadbuilder must consider realistically the sharply cut costs this plant provides; now the owner of a BUTLER Automatic set-up can bid any paving job successfully and make a greater profit. On the other hand a contractor with yesterday's plant may find he can get no work at all.

Write for the new Bulletin completely describing the new BUTLER 0-1-0. Just a postcard will do — but send it today.

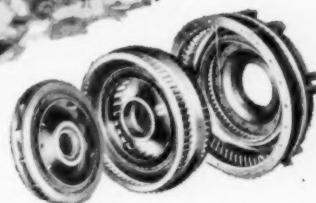
BUTLER BIN COMPANY

959 Blackstone Avenue • Waukesha, Wisconsin

... for more details circle 187, page 14



Twin Disc Torque Converter on shovel increases cable life over 100%!



Records of Zontelli Brothers, of Ironton, Minn., owners of the JoAnn Iron Mine, show replacement of *seven sets* of cable on a shovel equipped with straight mechanical drive—while replacing only *three sets* on one driving through a Twin Disc Torque Converter . . . a substantial reduction in down time, *plus* increased cable life of *over 100%*.

According to Al Fox, Master Mechanic, "considering the cost of down time in replacing cables—plus the cost of cable itself and the actual labor involved in replacing them, the Twin Disc Torque Converter saves us a lot of money."

Both these Model 54-B Bucyrus-Erie 2½-yd. shovels are used to load trucks with iron ore from the open pit mine, where it is then hauled to the washing and crushing plant and

processed. One shovel is powered by a diesel engine, with direct mechanical drive—and the other is equipped with a Caterpillar D337 Diesel, working through a Twin Disc Model CF Torque Converter.

In over-all comparisons, the torque converter-equipped shovel increases production, consumes less fuel, and substantially reduces maintenance costs wherever it is used.

For *automatic matching* to load demands, with torque multiplication up to *six times* . . . for cushioning out overloads, shock loads and vibrations . . . *specify* Twin Disc Torque Converters for your shovels. *Increase* production and cable life—*reduce* fuel and maintenance costs. *Get all the facts.* Write today to Twin Disc Clutch Company, Hydraulic Division, Rockford, Illinois. Request Torque Converter Bulletin 135-D.



This Model 54-B Bucyrus-Erie 2½-yd. shovel—powered by Caterpillar D337 Diesel Engine, driving through a Twin Disc Model CF Torque Converter—is loading ore from the JoAnn Iron Mine, owned by Zontelli Brothers, Ironton, Minn.



COMING UP . . .



the greatest year yet

By even the most conservative predictions, 1956 promises to be the greatest year yet for the construction industries.

This means that there will be even more jobs and bigger jobs to do than ever before. And wherever there's important, demanding hauling to be done, you'll find Macks on the jobs—the *Mack-sized* jobs.

When it comes to moving earth, rock, ready-mix concrete, equipment and building supplies, the construction industry knows there's nothing like Macks. For

instance, the economy-champion Mack Thermodyne® Diesel engine, the sure-footed Balanced Bogie with exclusive Mack Power Divider, traditional Mack rugged construction... these are among the many Mack features that assure long, trouble-free life at the lowest maintenance costs. You can count on Macks to get more work done—on schedule, and at a profit.

At the beginning of the new year, isn't it a good time to remind yourself again "Can I afford *not* to use Macks?"

MACK TRUCKS Empire State Building, New York 1, N. Y.





LIMA CRANES

... with mountings for every need

Cranes—Crawler mounted, Truck mounted—Wagon mounted. Baldwin-Lima-Hamilton builds them all and in sizes that will best meet your requirements. When mounted on rubber they are available in capacities up to 50 tons. They will go anywhere you care to drive a truck and at speeds up to 25 m.p.h. For work where mobility is not an important factor, LIMA crawler mounted cranes can be furnished in capacities up to 110 tons.

To increase their range of usefulness a variety of attachments are available—shovel, dragline, clam-shell, pullshovel and pile driver. Each attachment is interchangeable. For fast, more efficient crane service buy the crane that is first in quality—first in safety and reliability—BUY LIMA.

CRAWLER TYPE

- available in capacity up to 110 tons
- travel speed up to 1 m.p.h.
- all major operations air controlled except types 34 and 44
- independent boom hoist
- long-wide crawlers for greater stability

TRUCK TYPE

- mounted on LIMA 10 wheel truck carrier
- powered by two engines (one in carrier, one in rotating frame)
- travel speed, 25 m.p.h.
- types 24, 34, 44, 54 and 703 available with truck mounting

WAGON TYPE

- types 24, 34, 44, 54 and 604 available with wagon mounting
- one engine powers all operations including travel
- one operator controls all operations from cab
- rotating assemblies have same basic features as corresponding crawler type machines.

DISTRIBUTORS IN PRINCIPAL CITIES OF THE WORLD

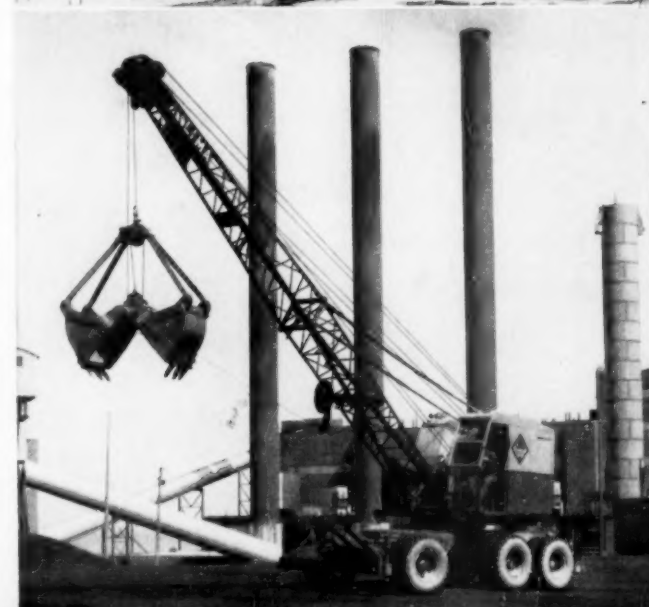
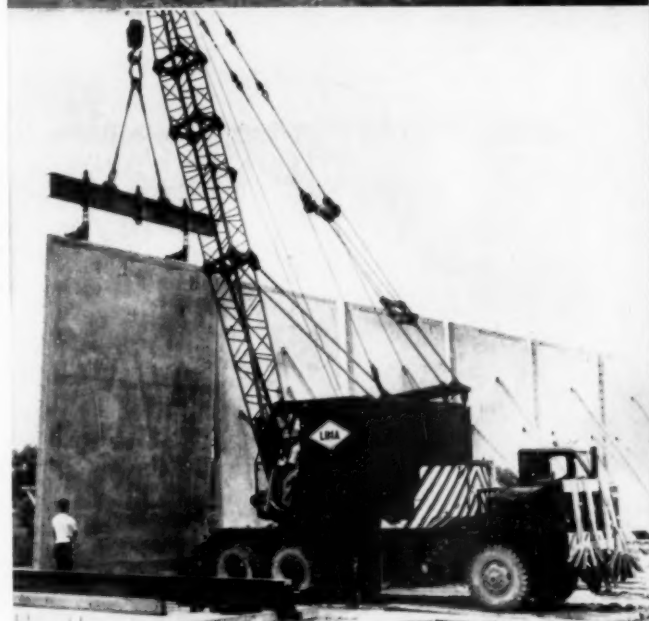


LIMA

SHOVELS • CRANES
DRAGLINES • PULLSHOVELS

BALDWIN-LIMA-HAMILTON

Construction Equipment Division • LIMA • OHIO • U. S. A.





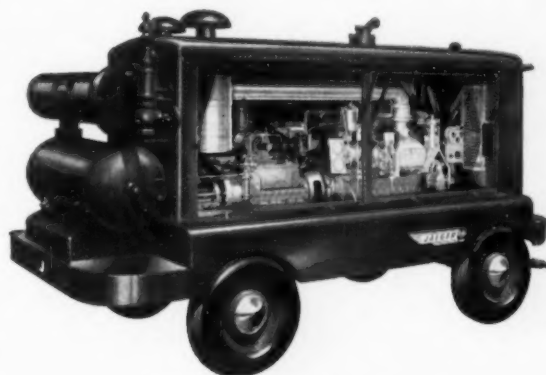
COMPLETE PILE DRIVING UNIT ON CRAWLERS: To obtain a minimum safe bearing of 75 tons, 12 WF 74 piles were driven to average 170' depth by splicing 65'

lengths. The compact driving rig was devised because of the limited area adjacent to heavy traffic. Union Building & Construction Corp., Passaic, N. J., contractor.

Jaeger Rotary fits tight spot on Turnpike

Widening the New Jersey Turnpike between Secaucus and Ridgefield involved driving piles to 170' depth in a very limited working area adjacent to heavy turnpike traffic. The job was done "with excellent results" by mounting a Jaeger 600 "Roto" compressor on the crane, the Jaeger rotary being compact for mounting and easily able to maintain constant full pressure in the Vulcan No. 1 hammer by direct feed.

Contractors who use Jaeger Rotaries for pile driving frequently describe their operation as "smooth as steam". This is because Jaeger engineers have devised faster-acting, closer-regulating controls to hold pressure constant under fluctuating demands. All speed modulation is smooth and stepless. There is never any over-run or racing of the engine. Your Jaeger "Roto" also operates at slower speeds than other rotaries, using less fuel and undergoing less wear. For complete data, call your Jaeger distributor or send for Catalog JCR5.



Jaeger Roto Air-Plus® "600".
125 and 365 cfm units also available.

THE JAEGER MACHINE COMPANY

223 Dublin Avenue, Columbus 16, Ohio

PUMPS • MIXERS • TRUCK MIXERS • SPREADERS • FINISHERS • LOADERS

... for more details circle 210, page 14

ROADS AND STREETS, January, 1956

the
all new "QUICK-WAY"

GREATER POWER AND CONTROL FROM BUILT-IN BALANCE



**CONSTANT
QUIET
POWER**

Rugged as the Rockies

"QUICK-WAY"- 50

1/4 Yd. 5 Ton

"QUICK-WAY"- 80

3/8 Yd. 8 Ton

"QUICK-WAY"-100

1/2 Yd. 10 Ton

"QUICK-WAY"-125

1/2 Yd. 12 1/2 Ton

and . . . Five new "QUICK-WAY" Carriers

THE MOST COMPLETE LINE IN THE SMALL SHOVEL FIELD

with MORE **Big Shovel** FEATURES

ALL CHAIN & SPROCKET DRIVE

Machine-cut steel and cast iron sprockets with compact, high-speed, heavy-duty roller chains give positive power, reduced noise, and greater flexibility under every operating condition. Oil and dust tight cases.



BULL GEAR, HOOK ROLLERS & MACHINE FRAME

Heavy, fully machined, hard steel rollers and roller path. Large, sturdy cast steel and electrically welded machinery frame. Perfectly balanced design assures minimum stress and absolute alignment to shafts, bearings and swing table gear.



ANTI-FRICTION BEARINGS

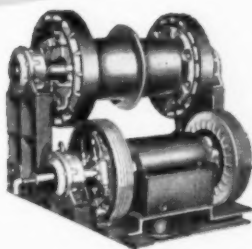
Self-aligning, anti-friction bearings on all high-speed, continuous, rotating shafts and drums. Special long-life, alloy bronze bearings on swing rollers and center rotating sleeve.

PRECISION BUILT, RUGGED, FULLY CONVERTIBLE

... the new "QUICK-WAY" models, designed to heavy-duty specifications ... with more big shovel features than any other in the small shovel field ... have perfect BUILT-IN balance that guarantees precision control, greater lifting power, longer life and more work per horsepower. Write today for complete information, or see your "Quick-Way" distributor for a FREE demonstration.

With the Famous Money-Making Line of "QUICK-WAY" ATTACHMENTS

Trench Hoe, Crane, Shovel, Dragline, Clamshell, Pile Driver, Magnet, and many other tools for special types of jobs.



MAIN ASSEMBLIES

Power up and down boom standard on all models.

High tensile steel shafting. Any one main assembly removable without tearing down others. Positive control shaft centers for 100% clutch and brake action.

AIR COOLED DRUMS

Large size, tower-ventilated, ductile iron clutch and brake drums, finned-ventilated swing assembly drums ... specially designed for cool, continuous running at top efficiency.



CLUTCH CONTROLS & HYDRAULIC SYSTEM

Smooth, positive minimum-effort control from new hydraulic system. New design control lever locks.



ADVANCE DESIGN LUBRICATION

Daily grease fittings centrally located on cab panel. Intermittent grease fittings easily accessible. Positive grease and dirt seals at all revolving points. Force-feed, filtered, circulating lubrication on all chain and sprocket drives and on main shaft bearings. Main bearings also running in oil.



COMFORTABLE FULL VISION CAB

All operating controls, including instrument panel and lock throttle, conveniently located in front of operator. Safety glass windows on all sides and top insure full vision—sliding and hinged windows provide maximum ventilation.



HINGED PANELS FOR EASY MAINTENANCE

Hinged, fold-out panels all around for quick, easy maintenance and adjustments.

"QUICK-WAY" TRUCK SHOVEL COMPANY

Denver, Colorado

A **Pitt-Turner** Subsidiary

Mail Coupon Today
For FREE Information

"QUICK-WAY" TRUCK SHOVEL CO.
Dept. 156—2401 East 40th Ave.
Denver 5, Colorado, U.S.A.

Please send complete information on the ALL NEW "QUICK-WAY" and the NEW "QUICK-WAY" carriers—check model number or numbers 50 (), 80 (), 100 (), 125 ().

Name _____

Address _____

City _____

State _____

Big output is built in

Individual Design

We believe that the right way to build an excavator is to match every part—from boom point to treads—to the specific rated capacity of the machine. At Bucyrus-Erie we call this Individual Design.

Here's what it means

Individual Design means striking the right balance between power, weight and speed for sustained high output at low cost over a long period of time. Bucyrus-Erie excavators match engine to dipper size so there's no waste of power; deck machinery components are not overloaded or underworked; boom strength and weight are right for the dipper size. There's never any overdigging or underpowering.

A grading project on U.S. Highway 85-87, near Greenhorn, Colo., was handled by this 1½-yd. Bucyrus-Erie 38-B. Machine owner is the Pioneer Construction Co. of Pueblo, Colo.

Here's how it pays off

This kind of design keeps Bucyrus-Erie excavators out front in production, with all parts working in smooth, efficient coordination. It keeps them on the job year after year with minimum down time and maintenance—there is no excess wear and tear on moving parts.

Individual Design is a big reason why Bucyrus-Erie excavators are still working profitably when others have lost their usefulness.

Your operations can use this kind of money-making performance so get the full details from your nearby distributor. He has all the facts on Bucyrus-Erie excavators from ¾ to 4 cu. yd.

155E55



South Milwaukee, Wisconsin



New manual on change orders and disputes

A booklet containing schedules to which the three principal government construction awarding agencies have agreed for the processing of change orders and disputes, has been published by The Associated General Contractors of America.

Entitled "Processing Change Orders and Disputes," the booklet has been distributed to AGC chapters and to field offices of the Corps of Engineers, Bureau of Yards and Docks, Bureau of Reclamation, and other federal contracting agencies.

The federal government for many years has stipulated in its standard contract provisions the conditions and time limitations within which contractors must comply with change orders and perform actions incident to filing claims, appeals and answers to decisions of contracting officers of the agencies. Previously there had been no time limitations on the government agencies.

The AGC's 35th annual convention on March 4, 1954, adopted a resolution which recommended that "government agencies and general contractors cooperate fully in handling expeditiously any change orders or disputes that may arise in connection with their contracts." Discussions of the subject were held by task units of the AGC contract Forms and Specifications Committee.

The new schedule was called to attention of the field offices of the respective government agencies. Attitude of the agencies is illustrated by the notification letter to Regional Directors by L. N. McClellan, Assistant Commissioner and Chief Engineer, Bureau of Reclamation, who wrote:

"Contractors have every right to expect as expeditious handling of contract adjustment and claims as circumstances permit, and all offices concerned are requested to give prompt attention to these matters as they arise in order for the Bureau to meet the time schedule which has been established. The AGC has recognized that full cooperation of both the contractors and the government will be required and it is believed that this schedule will result in contractors furnishing data in support of claims more promptly."

The booklet consists of a brief introduction, the text of an identical letter which AGC wrote to each of the agencies, and the texts of the letters received from the agencies. Copies are available at 20 cents each from Associated General Contractors of America, Inc., Munsey Building, Washington 4, D.C.

OWEN BUCKETS

*Reduced Costs
in Countless
Hopper
Operations*

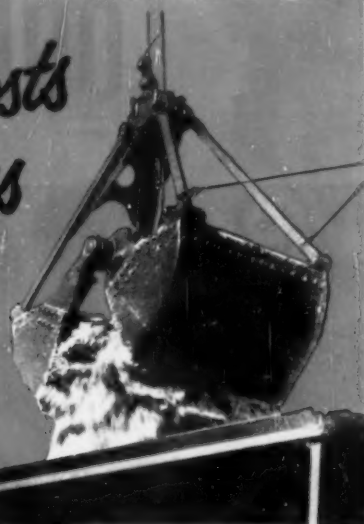


Photo Courtesy of Thew Shovel Co.

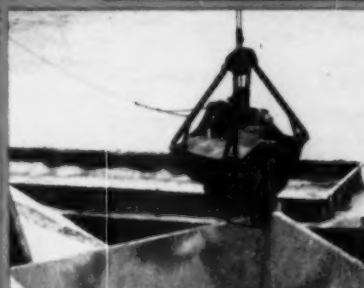


Photo Courtesy of Link Belt Co.



Write for the Owen Catalog...

THE OWEN BUCKET CO.

6070 Breakwater Avenue • Cleveland, Ohio

Branches: New York, Philadelphia, Chicago, Berkeley, Calif., Fort Lauderdale, Fla.

LOOK TO



HYDRAULIC HOISTS AND MATCHING BODIES by Gar Wood-St. Paul have lower net cost per payload hour. They're preferred by more truck owners for smooth, trouble-free operation.

FOR LEADERSHIP in Truck Equipment

Consolidation of America's pioneer hydraulic hoist companies offers advantages in engineering, sales and service for truck equipment users

Now there's *one* name to remember for the most advanced line of truck equipment on the market! It's Gar Wood-St. Paul, a name made possible by the recent consolidation of these two pioneer hydraulic hoist companies.

This is the most important news for truck equipment users since the invention of the hydraulic hoist! It brings these major advantages to you:

Engineering know-how and manufacturing skill—Gar Wood invented the hydraulic hoist . . . St. Paul developed it. Now both organizations are combined for new advances in truck equipment design.

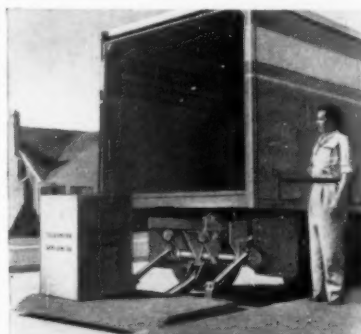
One world-wide sales and service organization of leading truck equipment distributors . . . experienced in application, qualified to analyze your equipment requirements and recommend the most efficient unit to fit them. This organization will also offer prompt service on any Gar Wood or St. Paul equipment you may already own.

New savings in shipping costs—With three modern plants producing the Gar Wood-St. Paul line, your distributor can select the base point most economical for you.

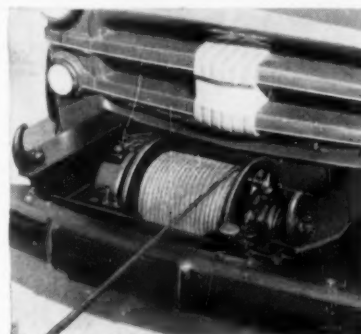
Find out now about the consolidated line of Gar Wood-St. Paul truck equipment . . . hydraulic hoists and bodies, Frate-Gates, truck cranes and winches, and sanitary refuse collection units. For the name of your nearest Gar Wood-St. Paul distributor, write now to: Customer Service Department, Gar Wood Industries, Inc., Wayne, Michigan.



GAR WOOD LOAD-PACKERS, the original packing-type refuse collection units, provide greater sanitation at lower cost for both community and industry.



GAR WOOD-ST. PAUL FRATE-GATES, with power closing, cut delivery costs . . . speed loading and unloading . . . reduce damage claims.



GAR WOOD WINCHES feature exclusive aluminum housings for faster heat dissipation, less dead weight. They're also components of Gar Wood Truck-Mounted Cranes.

GAR WOOD INDUSTRIES, INC.

Wayne, Michigan • Richmond, California

Plants in Wayne and Ypsilanti, Mich.; Findlay, Ohio; Mattoon, Ill.; Richmond, Calif.



Gar Wood
Truck Cranes



Gar Wood-St. Paul
PTO Units



Gar Wood-Buckeye
Spreaders



Gar Wood-Buckeye
Finegraders



Gar Wood-Buckeye
Ditchers



Gar Wood
Excavators

... for more details circle 198, page 14

ROADS AND STREETS, January, 1956 .

"Our TD-14A DROTT rips out CONCRETE SLAB and FOOTINGS a ¾-yard power shovel couldn't touch"

—Pangia Construction Company, Atco, New Jersey



Smack 8-inch-thick slab, or 5-foot-deep footings, of pipe-laced concrete with the 17,000-pound break-out force of an International Drott TD-14A. And something's got to give!

The pictures tell you what gives as this TD-14A Skid-Shovel, owned by Pangia Construction Company, Atco, New Jersey, slams through a 150-cubic yard concrete excavation job—for a new Sinclair station in Camden.

"We are ripping out concrete slab and footings that a ¾-yard power shovel couldn't touch," reports Owner Albert J. Pangia. "The operation is fast because of the breakout action. We use our TD-14A Drott Skid-Shovel for everything."

• Why not size-up these big advantages that give you new loader job range, yardage capacity, and profit opportunities? See your International Drott distributor for a Skid-Shovel or Four-In-One demonstration!

No other loader has it!

Apply the scientific lever principle of *exclusive and patented pry-over-shoe break-out, plus ground-level bucket roll-back*. And an International Drott Skid-Shovel gives you up to three times as much concrete-smashing, frost-breaking, boulder-bucking break-out force as other front-end loaders can deliver. *No other loader even has skid-shoes!*

This great hydraulic pry-out power over big skid-shoes shunts stresses directly into the ground, too—so they can't maul bucket or tractor.

And only an International Drott has the shock-swallowing protection of patented Hydro-Spring—that reduces the effects of carrying, dumping, or other impact forces to *operator and tractor* by 67 per cent, or more—increases equipment life by a reported 25 per cent. *Hydro-Spring also eliminates most hydraulic hose failures!*

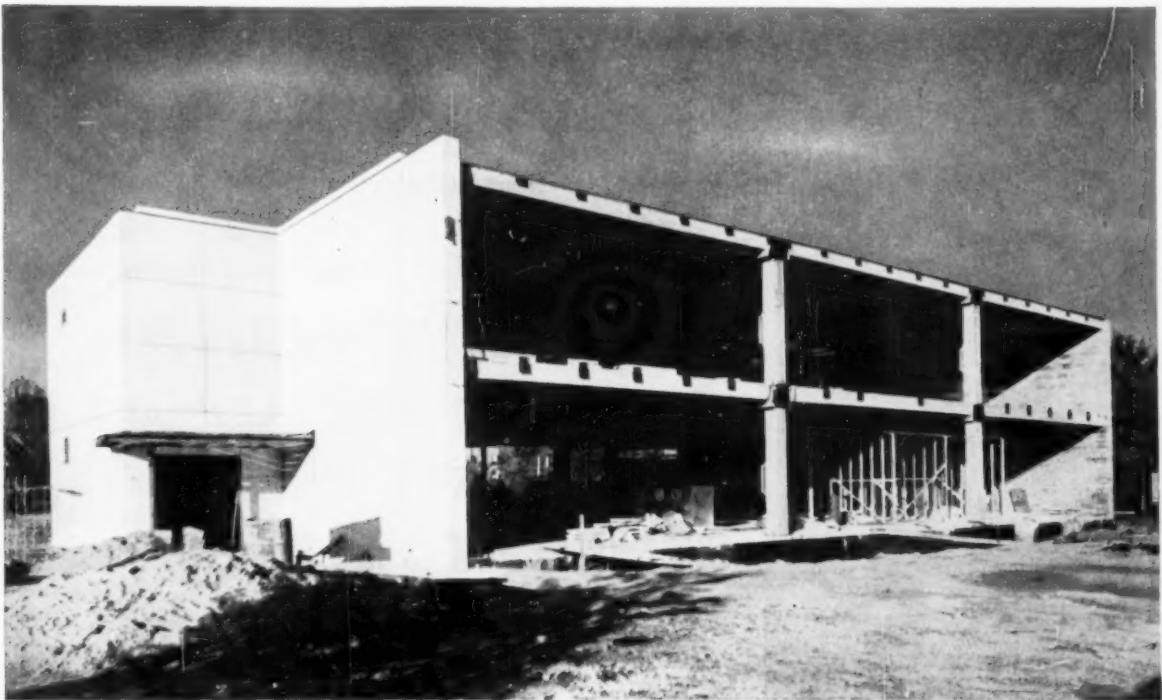


INTERNATIONAL®

DROTT

... for more details circle 253, page 14
ROADS AND STREETS, January, 1956

PRESTRESSED CONCRETE OFFICE BUILDING MULTIPLE STORY - CONTINUOUS DESIGN



Office building for United States Fidelity and Guaranty Company, Richmond, Va. . . . Architect, J. Henley Walker, Jr.; Structural Engineer, Wm. J. Blanton; Prestressed members by Concrete Structures Incorporated; General Contractor, Daniels Construction Company, all of Richmond.

COMPLETELY PRECAST and finished months ahead of the best estimated schedule for other materials, this structure cost the owner only \$1.62 per square foot per floor level in place.

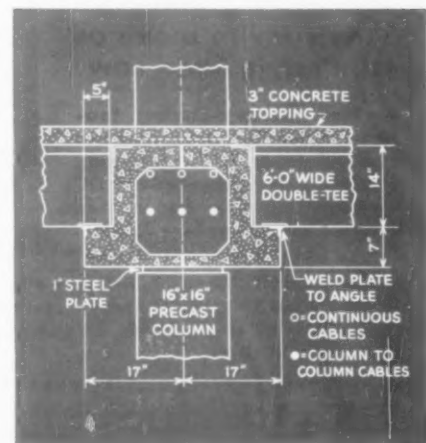
Precast reinforced columns, 32' on centers, have steel plates welded to girder plates creating a rigid frame.

Hollow girders, precast in halves and assembled into 32'-long members post-tensioned with three cables before erection, have three additional continuous cables added after erection. Hollow was filled with grout after tensioning. Cables are Freyssinet type, each composed of eighteen 0.196" diameter Roebling prestressed concrete wires.

Each 6'-wide double tee floor section, supported on girders 33'-4" on centers, is stressed with sixteen $\frac{3}{8}$ " diameter Roebling uncoated 7-wire stress-relieved prestressed concrete strands, pretensioned and bonded. Roof double tees have twelve $\frac{3}{8}$ " strands.

All precast concrete is 6000 psi ultimate.

Roebling engineers will be glad to give you full information on tensioning materials and fabrication methods. In addition, they are ready to cooperate with you to help attain top efficiency on any given application of this modern and economical structural material. Contact Construction Materials Division, John A. Roebling's Sons Corporation, Trenton 2, N. J.



Details at ground and 1st floor levels. Roof members are similar but have less prestress.

ROEBLING



Subsidiary of The Colorado Fuel and Iron Corporation



... for more details circle 234, page 14

ROADS AND STREETS, January, 1956



**As easy to move as
an electric hand saw!**

- 1. New Money-Saving features** . . . No DC brushes; just two easy-to-get-at collector ring brushes . . . No commutator or DC windings . . . No intermediate couplings; armature keys directly to shaft. Fewer parts to wear out — longer trouble-free generator service.
- 2. Constant Voltage** . . . less than 4% change from no load to full 1500 watt capacity . . . assures long service life for your electric tools . . . guarantees top performance at all times.
- 3. Overload Capacity** . . . 1500 watt continuous duty with generous overload capacity prevents tool stalling under heavy loads . . . insures uninterrupted service even when starting loads exceed operating loads.
- 4. Compact and Lightweight** . . . one man can easily carry this generator wherever you need electricity to power time-saving elec-

ALL NEW DESIGN! **Simple... Foolproof... Low Cost** **1500 WATT HOMELITE** **GENERATOR**

Model 35A115
Homelite Generator
1500 Watts, 115 Volt
60 Cycle AC



tric tools. No need for long, hazardous power-consuming cables.

Whatever tools you want to operate — electric saws, drills, floodlights, grinders, belt sanders, hammers, — the new Homelite 35A115 generator can save you money. For a free demonstration or additional information, call your nearest Homelite representative, or write:

SAVE EVEN MORE! New Homelite electronic idle control unit, available as optional accessory, runs engine at idle speed when no current is drawn . . . automatically brings engine to full speed when load is

applied.

Ask your Homelite representative to show you how this easily-installed accessory reduces engine wear . . . increases service life . . . cuts fuel consumption.

HOMELITE A DIVISION OF TEXTRON AMERICAN, INC.
7001 RIVERDALE AVE., PORT CHESTER, N. Y.
Manufacturers of Carryable PUMPS • GENERATORS • BLOWERS • CHAIN SAWS

. . . for more details circle 204, page 14

ROADS AND STREETS, January, 1956



THE ESSICK MODEL VR-54-T EASILY COMPACTING TO SPECIFICATION 21 INCH LIFTS OF GRANULAR FILL IN A CONFINED AREA ON A CALIFORNIA FREEWAY.

CONTRACTORS REPORT 45% TO 75% SAVINGS IN COSTS OF COMPACTING OF SUB-BASE, BASE AND SURFACE FINISHING

THE VR-28-W ESSICK VIBRATING ROLLER SHOWN COMPACTING BACK FILL OVER A CONCRETE DRAIN PIPE ON A SECTION OF THE SAN BERNARDINO FREEWAY IN CALIFORNIA. THIS COST CUTTING MULTI-PURPOSE MACHINE WILL COMPACT 25 CU. YDS. PER HOUR OF GRANULAR FILL MATERIAL TO THE MOST EXACTING SPECIFICATIONS. ROLLING ON EITHER HOT OR COLD ASPHALTIC MATERIALS OR PATCH PAVING THE 800 LB. VR-28-W IS EQUAL TO A 5 TON ROLLER.

CONTACT YOUR ESSICK DISTRIBUTOR OR THE ESSICK MANUFACTURING COMPANY FOR DETAILED LITERATURE

THE ESSICK MODEL VR-32-R VIBRATING ROLLER WORKING ON A HIGHWAY RESURFACING PROJECT IN PHOENIX, ARIZONA. THE COMPACTION OF THIS VERSATILE ONE TON ROLLER ON PAVING OPERATIONS IS EQUAL TO THAT OF A TEN TON ROLLER. IT IS OUTSTANDING IN COMPACTING ROCKS AND GRANULAR BASE MATERIAL.

**CONTACT YOUR ESSICK DISTRIBUTOR
OR THE ESSICK MANUFACTURING COMPANY
FOR AN "ON THE JOB" DEMONSTRATION**



ESSICK MANUFACTURING COMPANY

1950 SANTA FE AVENUE
LOS ANGELES, CALIF.

850 WOODRUFF LANE
ELIZABETH, NEW JERSEY

MANUFACTURERS OF CONSTRUCTION EQUIPMENT SINCE 1922

Affiliated with THE T. L. SMITH COMPANY, Milwaukee, Wisc.



... for more details circle 252, page 14

ROADS AND STREETS, January, 1956

LOADED

with *PROFIT MAKING* Features

More and more jobs today call for big crane capacity —plus *fast mobility*. Lorain's ability to produce this combination of capacity and mobility, to meet any conditions, explains why more and more Lorain Moto-Cranes are going to work. These rubber-tire cranes are "loaded" with the kind of features that mean better performance, lower costs and higher profits. In the Lorain Moto-Crane line, you select from the capacities below in combination with a wide variety of tire, axle and drive arrangements to meet all traction and travel conditions. Best of all, you get the Lorain designed and built Moto-Crane carrier, designed specifically for this type of work and loadings . . . and available in some models as an "8 x 4". Don't settle for less, when a Moto-Crane gives you so much for your money!



**ONLY
LORAIN
OFFERS THIS
SELECTION**

Here are a few Lorain Moto-Crane features:

- Front wheel drives* • 3 and 4 axle carriers* • Dual controls for self-propelled service • Removable counterweights for road travel* • Multiple position turntable mountings, adjustable for shovel-hoe-drag ranges or top crane capacity* • Precision boom lowering device • Pin-connected tubular chord booms for maximum capacity at minimum weight* • 2-piece, extensible tip extensions* • High gantries* • Ability to back-down-the-load • Third drum • Precision power load lowering . . . and there are many more.

See your Thew-Lorain Distributor for all the facts.

THE THEW SHOVEL CO., LORAIN, OHIO, U.S.A.

*Not on all models . . . not all equipment listed is standard.

MODEL	CAPACITY	MODEL	CAPACITY
DIXIE	6-TON	MC-424W*	22½-TON
MC-110	10-TON	MC-425	25-TON
MC-254	15-TON	MC-425W*	25-TON
MC-254W*	17½-TON	MC-524	30-TON
MC-424	22½-TON	MC-824	45-TON

*Extra-wide carriers for maximum lifting capacities "on rubber," without outriggers.

THEW LORAIN
MOTO CRANE

... for more details circle 232, page 14
ROADS AND STREETS, January, 1956

"**GREAT**" for all-around utility work

says Supt. on Garden State Parkway contract



On their 14 mile section of the Garden State Parkway in Cape May County, New Jersey, Public Constructors, Inc., Pleasantville, are using a 19 mph rubber-tired Tournatractor for all-around utility work.

This 208 hp tractor works all over their widely-scattered 2¼ million-yard sand job. It often moves ahead of the company's 33 scrapers to clear trees and brush and handle pioneer dozing. At times, it is used to level cuts and fills and to doze around bridges and culverts. Because of its speed and maneuverability, tractor-on-rubber performs these utility assignments without interfering with production dirtmoving.

Besides leveling work, Tournatractor is also used to push-load some of the contractors' 11 C Tournapulls. Where material is pure white sand, tractor's fast pusher-service loads the 16-yd. "C's" in as little as 45 seconds.

Used for other scattered jobs

Tournatractor is always ready for emergency calls, too. Jobs 5 miles away can be reached in 20 minutes (or less) due to its 19 mph speed. Cleaning haul roads and dozing fill on distant sections of the job are handled quickly and efficiently. Paved highways present no travel problems for the tractor-on-rubber. It goes everywhere under its own power...

needs no blocking, planking, trailer-loading and unloading. For all around utility service, it "gives a great performance day after day," says Supt. John Franks.

Discover for yourself why the fast, mobile Tournatractor is ideal for utility-type assignments, as well as major tractor work. Phone or write for a demonstration on your job, today. There's no obligation.

Tournatractor, Tournapull—Trademark Reg. U.S. Pat. Off. T-837-H-b



Tournatractor, with its 4-wheel drive, push-loads 16-yard C Tournapull in 45 to 60 seconds. Big low-pressure tires provide plenty of traction and flotation even in this poor, sandy footing.



LeTourneau-WESTINGHOUSE Company

Peoria, Illinois

A Subsidiary of Westinghouse Air Brake Company

... for more details circle 239, page 14



**THE STRONGEST WIRE
MAKES THE STRONGEST ROPE...
THAT'S WHY ONLY 1105 IS USED IN**

ROEBLING

Royal Blue



1105 WIRE is the strongest and toughest rope wire that has ever been developed.

Royal Blue is a new all-steel wire rope. It's made of 1105 wire—stands up in service—gives you more for your money because it has more to give.

Ask us for the full facts about Royal Blue Wire Rope, or contact your Roebling distributor.

ROEBLING

Subsidiary of The Colorado Fuel and Iron Corporation

JOHN A. ROEBLING'S SONS CORPORATION, TRENTON 2, N. J. BRANCHES: ATLANTA, 934 AVON AVE. • BOSTON, 61 BLEEPER ST. • CHICAGO, 6525 W. ROOSEVELT RD. • CINCINNATI, 3253 FREDONIA AVE. • CLEVELAND, 13225 LAKEWOOD HEIGHTS BLVD. • DENVER, 4801 JACKSON ST. • DETROIT, 915 FISHER BLDG. • HOUSTON, 6216 NAVIGATION BLVD. • LOS ANGELES, 5340 E. HARBOR ST. • NEW YORK, 19 RECTOR ST. • ODessa, TEXAS, 1920 E. 2ND ST. • PHILADELPHIA, 230 VINE ST. • SAN FRANCISCO, 1740 17TH ST. • SEATTLE, 900 1ST. AVE. S. • TULSA, 321 N. CHEYENNE ST. • EXPORT SALES OFFICE, 19 RECTOR ST., NEW YORK 6, N. Y.



Dumps anywhere—over-the-edge or on-the-move

Tournapull Rear-Dumps can go anywhere—on or off-the-highway—to place loads exactly wherever you want them.

To dump over the edge of bank, all you do is back close to dump point. Rig's big single tires and power steer take you over rough footing and soft fills where many trucks can't go. Dump is made by flicking electric switch on control panel. This instantly activates hoist motor. Body "rocks" back easily over rear axle. You have power up and power down. Movement is under positive cable control at all times, can be stopped at any angle. At full dump angle, bowl lip is at ground level *behind* rear wheels. This position prevents material from rolling forward under wheels. It also provides free dump over edge of bank and greatly reduces need for dozer cleanup.

Safe at all times

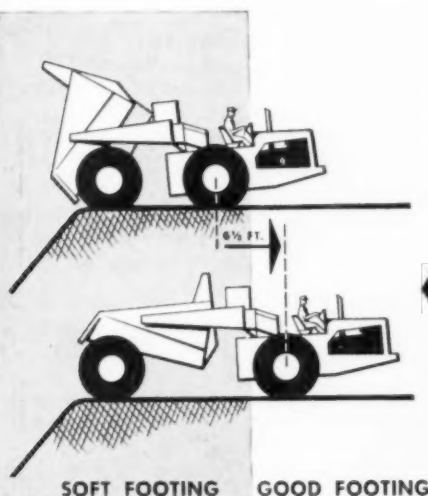
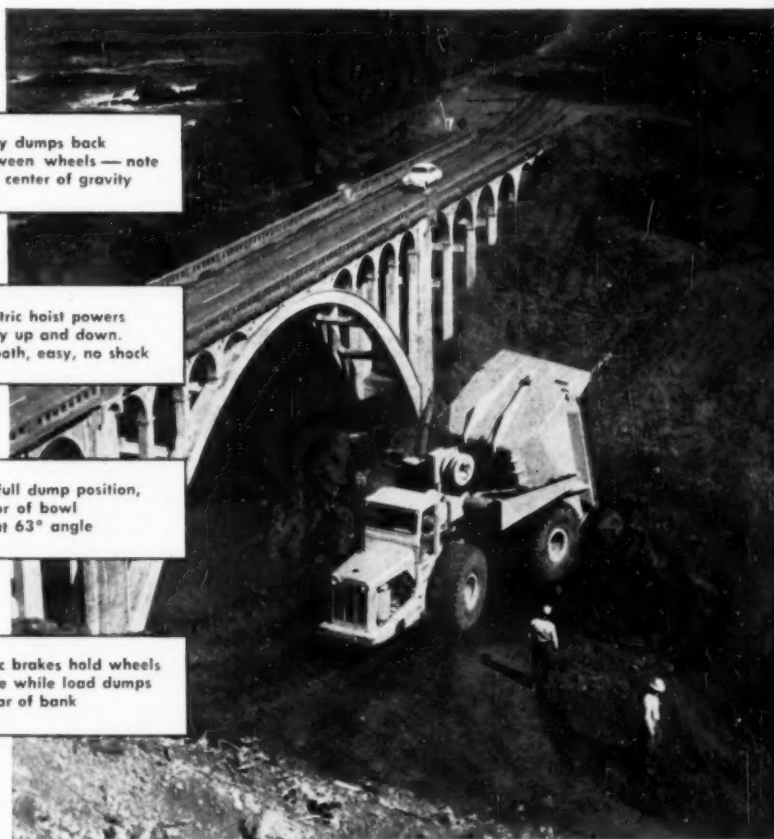
In dumping, Tournapull Rear-Dumps are safer than any truck. Front-wheel-drive keeps power and traction on solid footing well ahead of rear

Body dumps back between wheels — note low center of gravity

Electric hoist powers body up and down. Smooth, easy, no shock

In full dump position, floor of bowl is at 63° angle

Disc brakes hold wheels safe while load dumps clear of bank



wheels. Because body does not need to clear frame, springs, axle, or differential, its center of gravity stays low, even during dump. Oversize multi-disc air brakes—with *more braking surface on one wheel than comparable-size trucks have on all four*—prevent creeping or rolling.

Separate braking of front and rear wheels can be used with action of hoist to help front wheels pull away from edge of soft dump. In case of trouble, rear brakes are set, front brakes released. When bowl is lowered from normal dumping position, free-rolling prime-mover wheels are pushed forward. On the "C" size Rear-Dump, they move 6 1/2 ft. — usually enough to find good footing. If front drive wheels do not reach good footing after bowl is lowered, same "leap-frog" process can be repeated. Simply pull rear wheels forward by setting front brakes and raising bowl, then set rear brakes and push front wheels ahead by lowering bowl.

Accurate spreads while moving

Tournapull Rear-Dumps can also spread on the run. Bowl can be safely raised and lowered at normal haul speed. Operator simply positions bowl for desired flow of material and continues to drive.

There's a Tournapull Rear-Dump size to fit your needs

"D"	"C"	"B"
9 TONS	22 TONS	35 TONS
138 HP	208 HP	293 HP

Prime-movers for these Rear-Dumps also power scrapers, bottom-dumps, flatbeds, and cranes.

Tournapull—Trademark Reg. U.S. Pat. Off. R-778-G-b



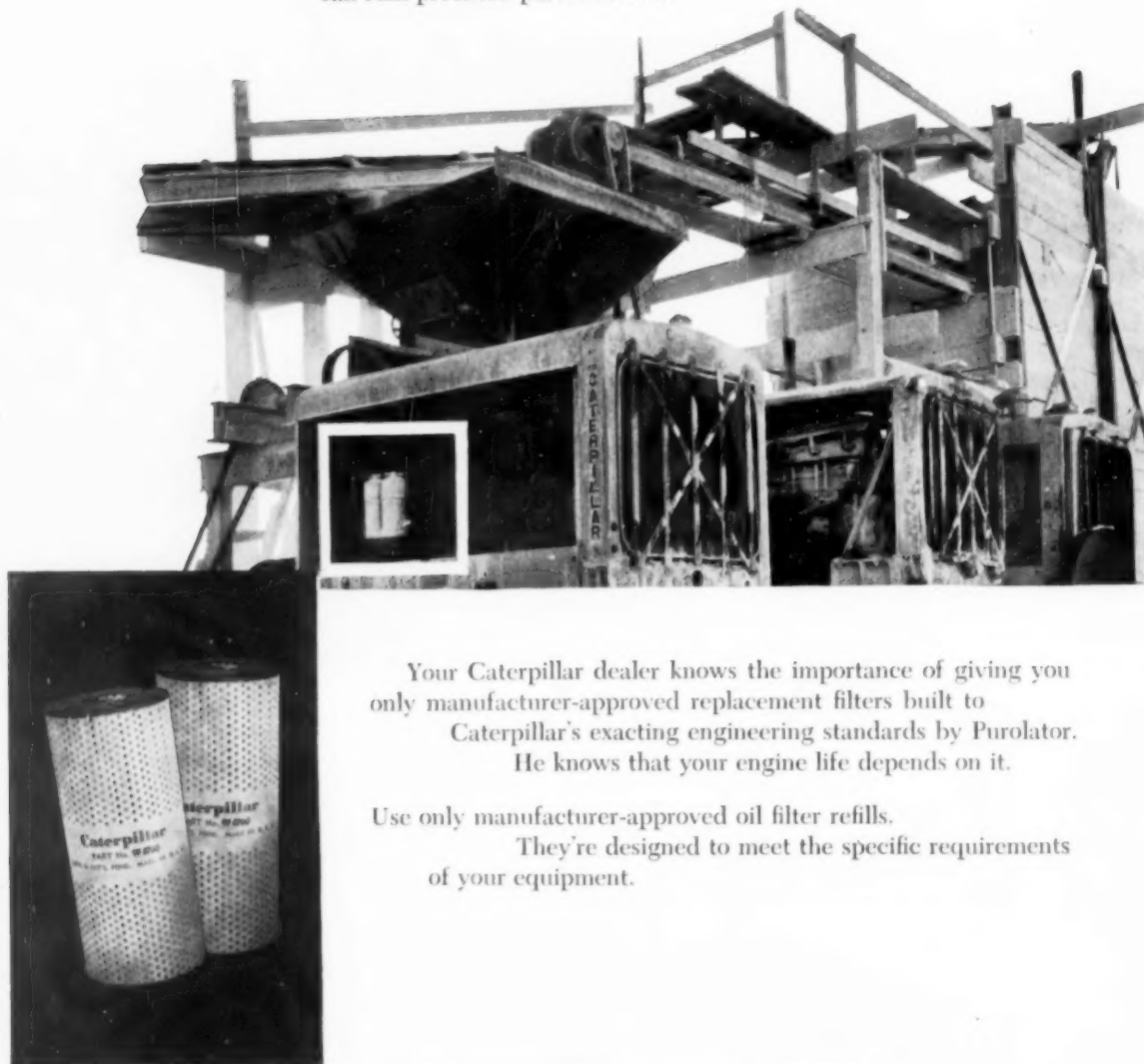
LeTourneau-WESTINGHOUSE Company

Peoria, Illinois

A Subsidiary of Westinghouse Air Brake Company

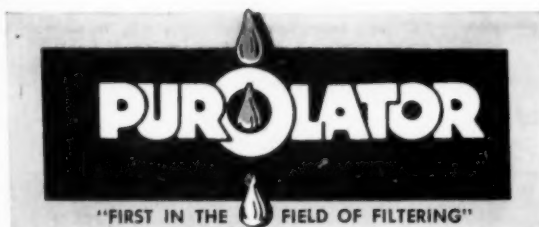
are substitute filter refills ruining your engine?

When some "off-brand" or "will fit" oil filter refills are used in a full-flow system, they cannot handle sufficient volume. The by-pass valve opens and pours dangerous unfiltered oil into your engine. This inadequate filtering can ruin precision parts in hours.



Your Caterpillar dealer knows the importance of giving you only manufacturer-approved replacement filters built to Caterpillar's exacting engineering standards by Purolator. He knows that your engine life depends on it.

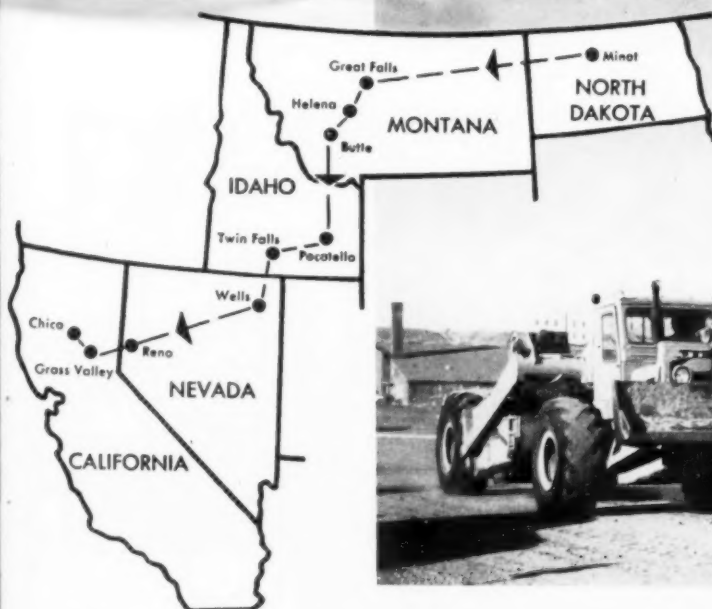
Use only manufacturer-approved oil filter refills. They're designed to meet the specific requirements of your equipment.



PUROLATOR PRODUCTS, INC., Rahway, New Jersey and Toronto, Ontario, Canada

... for more details circle 221, page 14

ROADS AND STREETS, January, 1956



Drives 1,750 miles . . .

total cost **\$170**
total saving **\$800**

What would you do if your dirt-moving equipment was in North Dakota and you had the chance to work in California?

If you had crawlers and scrapers, or big self-propelled scrapers, you'd probably ship them by rail. It would cost you at least \$870 per unit one-way, and the trip would take a week or 10 days. Expensive? Yes, but about the only method you could use.

Vernon Testerman, Minot (North Dakota) contractor, had another solution to the problem. His 7-yard D Tournapull, he figured, could easily make the trip under its own power. After all, he had driven the "D" all over North Dakota. The unit's low-pressure tires did no damage to pavement. It was narrow enough and light enough to go anywhere. And it could travel most of the way at 28 mph.

Remembering these advantages, Contractor Testerman checked his machine, loaded fuel drums and

other supplies in the scraper bowl, filled up the tank and started off.

Travels 80 hours, averages 22 mph

First check-point for contractor and machine was Great Falls, Montana. From here, the "D" traveled to Helena and Butte, Montana . . . then through Pocatello and Twin Falls, Idaho . . . Wells and Reno, Nevada . . . and Grass Valley, Calif.

On the 8th day, Tournapull arrived in Chico, California. It had traveled 1,750 miles. Total running time, as clocked by the hour-meter, was 80 hours.

"Cost of the trip," writes Testerman, "was exactly \$170. That includes fuel, oil, meals, hotel, even cigarettes for the driver, Garry Dibble of Stanley, N.D. It also includes the price of a new water pump. I also had to buy a license in Montana, which cost \$11; otherwise I wasn't stopped or asked any questions except by curious people who said I was crazy. They will really

think so when I meet them on the road back home to North Dakota."

Or maybe they won't think so, when they realize Testerman saved \$700 on the one-way freight bill alone. Or that he also saved about \$100 for air or rail transportation for his operator. Plus 1 or 2 days in time. Plus a lot of trouble loading, unloading, etc.

Finishes jobs before others arrive

Chances are, you may never have to make a thousand or two-thousand mile trip with your dirtmoving equipment. However, Tournapull's work-and-run ability cuts non-productive time to a minimum on any length move. With Tournapulls, you take the shortest route between jobs, over main highways and through cities, to make the most economical use of manpower and equipment. As Mr. Testerman puts it, "With D Tournapull, you can travel to a small job and have it finished before another type of machine could be loaded and moved. The money you once paid for hauling can be put in your pocket."

Ask us for a demonstration of the LeTourneau-Westinghouse D Tournapull so you can check its mobility and other advantages for yourself. Call to arrange time and place.

Tournapull—Trademark Reg. U.S. Pat. Off. DP-647-G-b

LeTourneau-Westinghouse Company

PEORIA  ILLINOIS

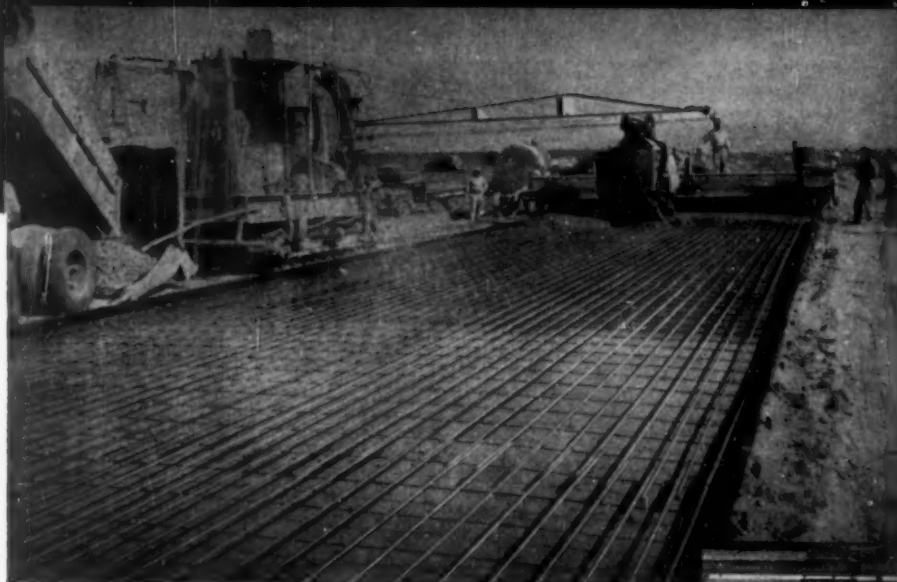
A Subsidiary of Westinghouse Air Brake Company

On the job, "D" Tournapull usually self-loads. Here it heaps 5 pay yds. of sandy loam in 1 min. Typical 900' cycles take 2½ minutes.

Tires provide such good compaction, rollers often are not needed. Nor are small tractor-dozers; "D's" blade does much of their work.



Picture of a Good Road's Backbone



with **LACLEDE** Distributed Steel Reinforcement

*For smoother-riding, safer concrete pavements with
long life, safety and low maintenance costs, eng-
ineers specify*



Laclede Welded Spacers
Assure Dowel Alignment

LACLEDE HIGHWAY STEELS

- WELDED WIRE FABRIC (in sheets)
- WELDED DOWEL SPACERS
- MULTI-RIB REINFORCING BARS
- ACCESSORIES
- CENTER JOINT
- RECESS JOINT



Producers of Steel
for Industry and Construction

LACLEDE STEEL COMPANY

ST. LOUIS, MISSOURI

... for more details circle 212, page 14

ROADS AND STREETS, January, 1956



More work, in less time at low cost

Watch the smoothness of a modern Adams motor grader at work on ditch, bank or surface work. See how easily it picks up the load, how steady it blades at any work speed. Take the wheel, drive it as you would your automobile... through city streets, to 25 mph... in reverse to 13 mph. Stand or sit at the controls, notice how clearly you can see grade and load on the blade. With convenient and positive-working power-controls you raise, lower, revolve, or extend the blade to any desired position.

Look how heavy, box-construction, one-piece frame of this husky grader is built to resist shock and stresses. Grader weight is distributed to make use of full power in all gears. Big, powerful engine starts instantly in any temperature; develops power-to-spare, with lugging ability to move heavy loads in tough going. Note how constant-mesh transmission gives smooth progression of speed through all gears... no spur gears to clash.

8 Forward Speeds (up to 25 mph)

There is a speed for every grading operation. You get work done fast, and save time moving job-to-job. Three additional "creeper speeds"

(.23 to 1.82 mph) are optional. They make it easy to rip hard-packed roads and old asphalt, root out unseen roots and stones without severe shocks. Important also for accurate finishing in tight places. *No other grader offers this wide range of operating speeds.*

4 Reverse Speeds (up to 13 mph)

Wide range of reverse speeds saves time on shuttle-grading and mixing, backing to buck snow drifts, etc.

Double-Action Hydraulic Brakes. Service brake applies braking action to transmission as well as wheels; surer, safer stops are assured, and, with less pedal effort.

Rubber-Mounted Engine Vibration is not transmitted to grader to annoy and fatigue operator. Means more accurate grading, better end-of-day working or work efficiency.

See ADAMS before you buy

Judge your next motor grader on the basis of *performance*. Ask your LeTourneau-Westinghouse Distributor to show you a modern Adams grader at work. Find out for yourself why Adams graders do *more* work, in *less* time, at *lowest* cost... why they make taxpayers happy!

A size ADAMS for every need

Model 330 — with 80 hp diesel engine. A sturdy general-purpose machine in the 20,500 lb. class.

Model 440 — with 104 hp diesel engine, 21,500 lbs. A popular size for city and county use.

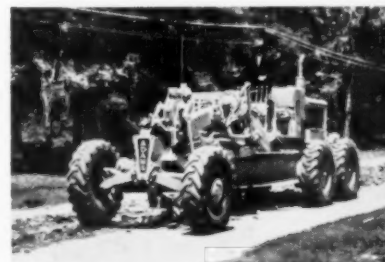
Model 550 — with 123 hp diesel engine. Heavy-duty, all-purpose tool for heavy maintenance and construction. Approx. 23,500 lbs.

Model 660 — with 150 hp diesel engine, 27,730 lbs. and up. For extra-duty construction. Does up to 30% more work than any grader you have ever used.

Traveloader — A high-speed, heavy-duty, self-propelled, belt-type loader for picking up and loading into trucks from windrows or stockpiles. Write for details.



With dozer-blade (optional) Adams grader roots out brush, pushes debris off right-of-way, backfills around culverts, etc.



Rugged scarifier (optional) rips up gravel, crushed stone, blacktop, sheet asphalt road and street surfaces. Has longer-wearing replaceable points.

AG-2-P-b

A Subsidiary of
Westinghouse Air Brake
Company



LeTourneau-Westinghouse Company

PEORIA, ILLINOIS



D9 MOVES BIG YARDAGE

for
**MORRISON-
KNUDSEN**

A CAT® D9 Tractor with No. 9S Bulldozer is the prime earthmoving tool on this Morrison-Knudsen contract in Idaho. The job—relocating 11.37 miles of the Idaho City-Owl Creek road—involves clearing 64 acres and moving 337,000 cubic yards of dirt and rock. One rock cut is 87 feet deep and there are fills up to 30 feet.

With its huge 14-foot dozer, capable of handling up to 9 cu. yd. at a blade load, the D9 makes 40 passes, 200 feet long, per hour.

Now that the D9 has proved itself on jobs all over the country, owners recognize it as the top production machine among big tractors. It's the first track-type tractor with Turbocharger. The 286 HP Caterpillar Diesel Engine gives it ample power to match

its weight and traction. You have a choice of torque converter or oil clutch drive. And there is "Live-shaft" drive for rear-mounted equipment.

Operators say this big machine is "as easy to handle as a small tractor." Easy to service, too. The exclusive, trouble-free oil clutch, separately removable power train components and a fuel system that needs no adjustments in the field are among the reasons why.

Your Caterpillar Dealer can give you some eye-opening facts about the economy of the D9 for big yardage jobs. Ask him for a working demonstration today.

Caterpillar Tractor Co., Peoria, Illinois, U.S.A.

CATERPILLAR*

*Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

**NAME THE DATE...
YOUR DEALER
WILL DEMONSTRATE**

Underpinning For Expressway Job

By **Milton F. Page** Bridge Engineer, Cook County Highway Department, Chicago, Illinois

Underpinning required during reconstruction of bents and deepening of footings, necessary to accommodate skewed passage of depressed express roadway.

ONE of the most complicated problems in the construction of the Congress Expressway was the underpinning of the Chicago Transit Authority two-track Garfield Park "L" (elevated railway structure). This structure was built before the turn of the century and is composed of longitudinal deck plate girders supported on laced channel columns bearing on concrete pedestal foundations without piling. Train movements are heavy, amounting to 374 trains a day.

At a point west of Kostner Avenue the two four-lane pavements of the expressway separated by a 79-ft. median, cross under the existing elevated structure. The 79-ft. median will, when the expressway is completed, contain the tracks, but until

that time the existing elevated structure had to be kept in operation while the expressway and new tracks were constructed. (Fig. 6).

The problem was further complicated by the pronounced skew between the elevated structure and the expressway and the fact that the new pavements and tracks would be four to eight feet below the footings of the existing elevated structure.

Ten bents of the elevated structure became involved, extending over a distance of approximately 500 ft.

Five bents were located within the new expressway pavement areas and required underpinning and new supports clearing the expressway pavements. (Fig. 1 and 6).

Four bents cleared the pavements,

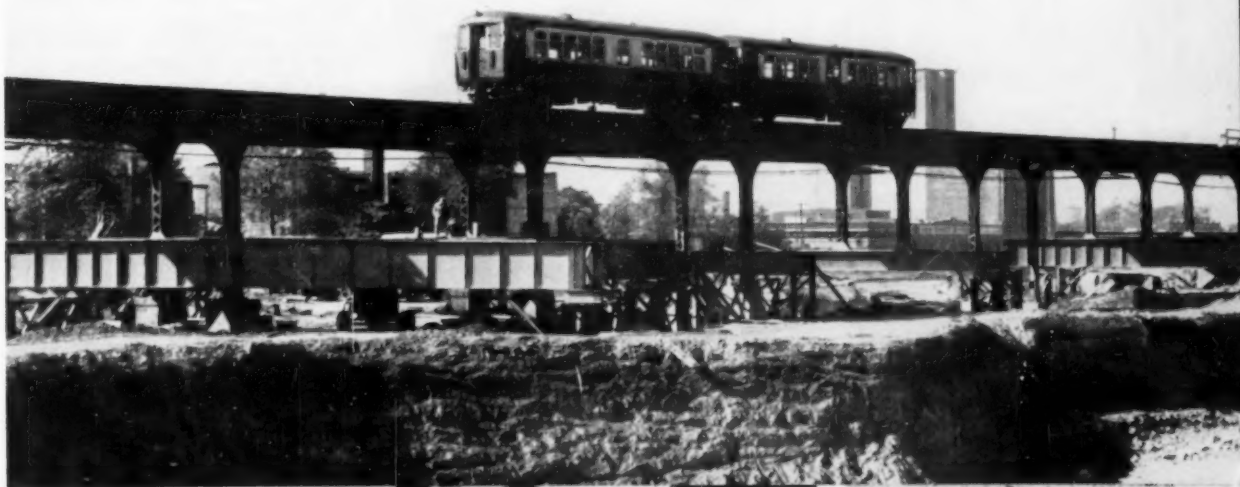
but the foundations were above the new grade line. (Fig. 6).

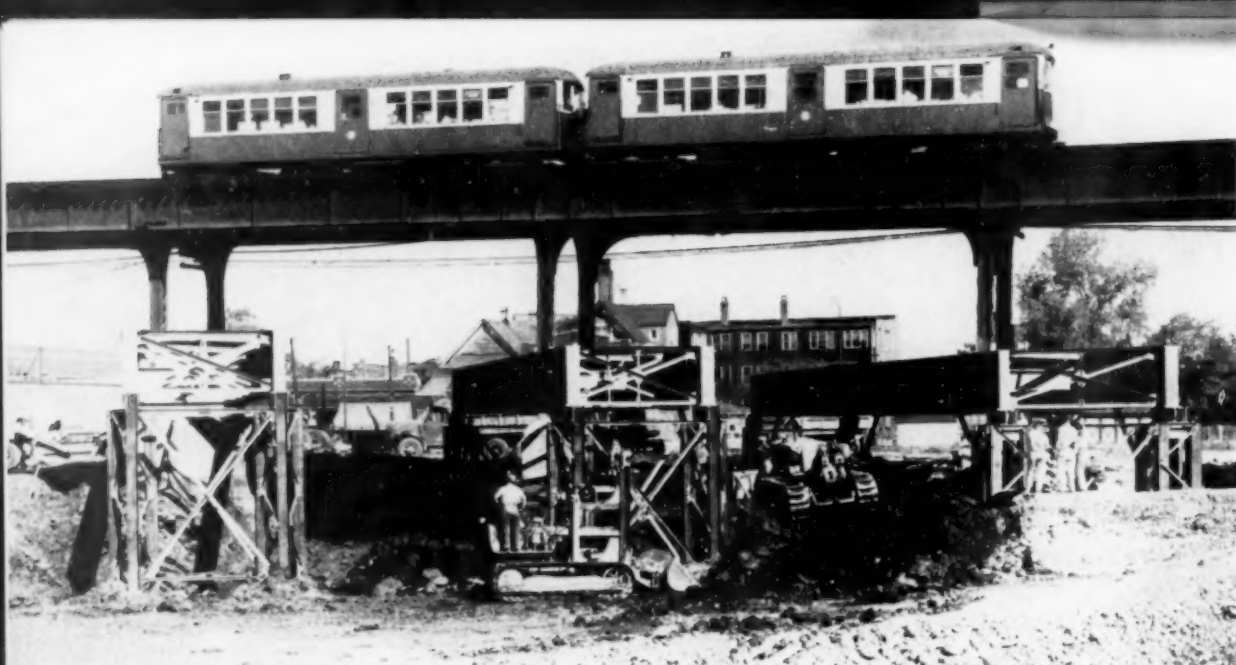
One bent obstructed the area required for the new tracks in the median and required underpinning and new supports in the median clearing the proposed tracks. (Fig. 1 and 6).

Beams on Skew

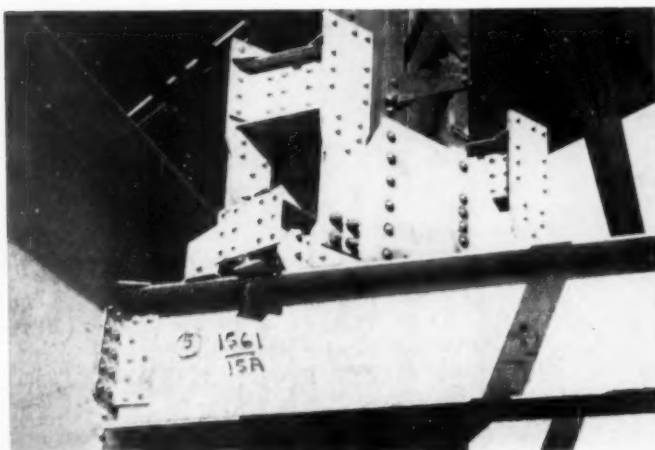
In work of this nature it is usual to place the needle beams at right angles to the axis of the structure to be underpinned. This method was considered, but due to the large skew angle between the expressway pavements and elevated structure was abandoned because of the excessive spans required for needle beams. The beams were therefore placed approximately at right angles to the expressway pavement and skewed to the elevated. This somewhat complicated the design and construction, but was considered basically beneficial by reducing spans and increasing lateral stability.

- Figure 1. Looking west from Kostner Avenue grade separation. West-bound pavement to be under girders at right; east-bound pavement under girders at left; C.T.A. tracks to be laid under girder in center of picture.

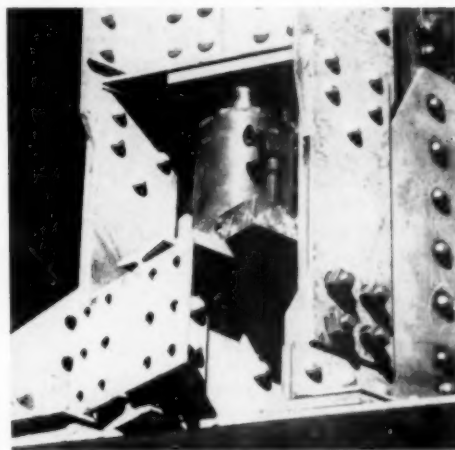




● Figure 2. General view; shows how excavating proceeded after underpinning.



● Figure 3. Yokes in place bolted to brackets.



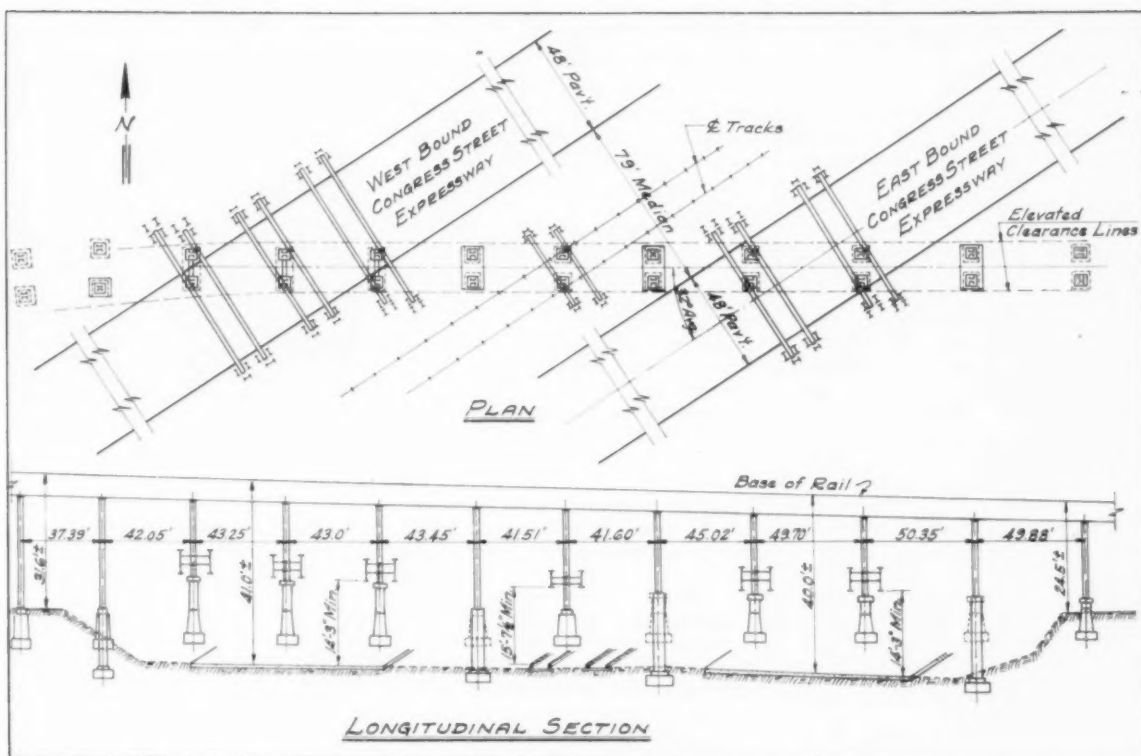
● Figure 4. Jack in position, bearing on jacking beam below and yokes above. Note shim plates in place under bracket flange angle.



The five bents which interfered with the new pavements were underpinned and resupported in the following manner:

Plate girder needle beams 5 ft. deep varying in lengths from 62'-0 to 78'-0 were placed, one on each side of each elevated bent and supported on driven and well braced minimum 22-ton capacity H-pile clusters. The piles were driven in holes predrilled to new grade. The double plate girder needle beams were braced in both vertical and horizontal planes.

● Figure 5. Detail of piling supporting needle beam.



● Figure 6. Plan and longitudinal section.

Lacing bars were removed from the elevated bent columns and new brackets were riveted on the columns in line with the tops of jacking beams between the needle beams. An inverted U-shape yoke (Fig. 3) was then bolted to the brackets and 50-ton jacks were inserted to bear on the jacking beams between the needle beams and the top of the yokes. (Fig. 4). Two jacks were used on each of the two columns of each bent.

Transferred to Beams

The four jacks were extended simultaneously and transferred the loading from the column bases to the needle beams, at which time steel shim plates were installed between the brackets and the needle beams and bolted in place. The dead load and live load deflections were calculated in advance and shim plates were provided to fill the gaps between the brackets and the needle beams, which were the result of the deflections of the needle beams due to the elevated structure load. The shim plates varied in thickness at each column between 5/16 in. and 13/16 in. and this amount of jacking was sufficient to lift the column bases free of the old foundations. (Fig. 7 and 8).

The jacking yokes were left in place

for a period of 24 hours while the needle beams were checked for possible settlements, after which the yokes were removed and reused on the next bent. The old concrete foundations were then removed.

The four bents which cleared the pavements but whose foundations did not extend deep enough, were handled in a different manner. The problem in this case was to support the elevated columns while the old founda-

tations were removed and new and deeper foundations were installed. This was done by erecting frames adjacent to each of the elevated bents. These temporary frames were composed of 33-in. wide flange beams for the top beams and 10-in. wide flange columns. The jacking operation was the same as for the long plate girder spans except that the columns were lifted sufficiently to clear the bases in live load deflection.

● Figure 7. Column base before jacking. Note pencil mark on unthreaded portion of anchor bolt.



● Figure 8. Column base while jacking. Note diminishing distance to pencil mark on anchor bolt.



Underpinning Job

(Continued)

After jacking and transferring the elevated load to the temporary frames, the old concrete foundations were removed and the new and deeper foundations installed, after which the jacks were released and the loads put back on the new concrete foundations. The temporary frames were reused on the various bents.

The bent which interfered with the placement of the new tracks in the median was underpinned and resupported in exactly the same manner as the plate girder spans. The only difference being that due to the short span of the needle beams, 36-in. wide flange beams were used in lieu of plate girders.

The expressway pavements were set for opening to traffic late in 1955. The present elevated structure may continue in operation for one or two years before the tracks in the median are completed and trains operated thereon. The existing elevated structure and underpinning will be removed at that time.

Kenny Construction Company is the general contractor; steel fabricators, Allied Structural Steel Companies.

The foregoing article originally appeared in "Cook County Highways," employee organ of the Cook County Highway Department, William J. Mortimer, superintendent.

- Figure 9. New foundation, with columns in place, at one of the four bents that cleared the pavement.



Microwave-Mobile radio for Ohio turnpike

A combined microwave-mobile radio system which provides for police, maintenance, and general administrative communications has been installed along the entire route of the new 241-mile Ohio Turnpike. The comprehensive RCA system provides eight voice and teletype channels and will link all major turnpike installations and vehicles. The system represents a cost of more than \$1,200,000, including a 7-year contract with the RCA Service Company for around-the-clock maintenance.

The system utilizes both microwave and mobile VHF equipment for an interlinking radio network. Elements of the system include:

1. RCA Carfone VHF base stations at each of 17 toll plazas which will dot the turnpike from border to border. Each base station will utilize a directional antenna oriented to the nearest of the turnpike's eight maintenance centers, which will function as key relay stations for both microwave and VHF messages in the radio network.

2. RCA CW-20 microwave radio relay stations and VHF base stations at each of the eight maintenance centers. Maintenance center number four, which will serve also as a junction station, will be equipped with an additional microwave link direct to the turnpike's administration building, located at Berea, Ohio.

3. A microwave radio terminal station and central control equipment for all microwave and VHF circuits at the administration building. Also installed will be facilities for automatic tape recording of all messages.

4. Carfone mobile radio units in 100 turnpike police patrol and maintenance vehicles.

The over-all communications system is divided into two operating divisions, eastern and western, to provide maximum radio traffic with minimum signal interference. Separate voice and teletype channels are installed for each division.

The microwave portions will be utilized for point-to-point communication from the toll plazas to the maintenance centers.

The VHF radio equipment, designed for operation in a combined VHF-microwave network, will be used for police operations and for general turnpike communications.

All messages, both microwave and VHF, will be microwave-relayed automatically to the administration building via the microwave junction station at maintenance center No. 4.



- Combined microwave-mobile radio system, for police, maintenance, and general administrative communications along entire route of new 241-mile Ohio Turnpike, has been installed by Radio Corporation of America. Project Manager Russell S. Deetz, in charge of operating the Turnpike, is shown using RCA Carfone mobile radio for two-way communication from his car.

The complete radio network will provide eight operating channels. These will include two VHF channels for police operations; two VHF channels for general turnpike communications; one teletype channel, for operation between the administration building and each maintenance center, and between any two of the latter; and one two-way voice channel for use by maintenance personnel over the entire radio system.

Two telephone communications channels are also provided, and established dial-telephone communications, via microwave, between the administration building and each maintenance center. This special installation utilizes a cordless switchboard at the administration building and automatic switchboards at maintenance centers.

Provisions have also been made for a ninth channel which will be utilized eventually to provide a communications link with the Pennsylvania turnpike and the new Indiana toll road, now under construction. The system could be expanded to more than 30 channels if additional facilities are required.

The turnpike's eight maintenance centers will operate as key relay stations in the overall microwave-VHF system. They are equipped for reception of both VHF and microwave messages, and for relay by microwave of all messages to the administration building for action and for information.

Standby equipment for both microwave and mobile radio operations will be installed at each of the eight maintenance centers.

50 Years of Roads and Streets

By Halbert P. Gillette

GILLETTE, Hay and Gillette, contractors, went out of business in 1902 because the State of New York had passed an 8-hour law after the firm had signed several state contracts. One of these was for the second New York road built under the new State Aid Act, prior to which a 10-hour day was standard practice.

Having written articles for *Engineering News* on Economics of Road Construction, also a book on Earthwork and Its Cost, one of those Gillettes, the present writer, applied for and secured a position on the editorial staff of *Engineering News*. There he met Myron C. Clark, director of the book publishing department of the *News*, and a year or so later they decided to become partners in the publishing business. Their first book was *Rock Excavation*, followed a year later by the *Handbook of Cost Data*, the profits from which allowed them to launch, in January of 1906, a monthly magazine for contractors in the civil engineering field. To indicate that it did not cover building contracting also, its title was *Engineering-Contracting*, and its front cover soon carried an ad entitled: Serial Sequel to Gillette's *Handbook of Cost Data*.

When nearly as many engineers as contractors subscribed, the title of the magazine was changed to *Engineering and Contracting*. About then the State of Oregon passed the first law taxing gasoline to secure funds for state aid in road building, and *Engineering and Contracting* became the first engineering periodical to urge the passage of similar laws not only by states but by the federal government. Such laws were opposed by *Engineering News* and *Engineering Record*. The editor of *Engineering and Contracting* served on committees that went repeatedly before both houses of Congress and eventually secured passage of a law that made the federal government a great financial contributor to the betterment of highways throughout the United States.

As a contractor the writer had seen the need of an American Society of Engineering Contractors, so editorials were written advocating such an organization. When about 800 applications for membership were secured it was launched, and ultimately became

the progenitor of the Associated General Contractors.

Shortly after the first issue of *Engineering-Contracting* was out, Mr. Saunders, President of the newly amalgamated Ingersoll and Rand Companies, advised the writer to endeavor to merge several construction magazines. This advice was followed, resulting soon in merging *Contract News* and *The Dirt Mover* in *Engineering and Contracting*. A later merging was *Municipal Engineering*, and *Good Roads* still later. Finally *Engineering and Contracting* was split into two monthlies, *ROADS AND STREETS* and *Water and Sewage Works*, the former taking over all the circulation among contractors and their engineers and superintendents.

Going back again to the early days of our magazine publication, in 1906 the writer was appointed Chief Engineer of the Washington Railroad Commission, under whom the 3,000 miles of main track and terminals were appraised. When this was begun, two associate editors of *Engineer News*, Charles T. Murray and Charles S. Hill joined the staff of *Engineering and Contracting*. Analyses of construction costs of railway work in Washington provided material for articles and for the *Handbook of Construction Costs*.

As above indicated, state and federal aid in financing and building roads began on a noteworthy scale about 50 years ago. Although highway construction has now (1956) reached a stage where the expenditures are far greater than for any other kind of public works, it is clearly destined to forge ahead even more rapidly in the future. This applies not only to North America but to South America and many other regions, in proportion as each increases the number of motor vehicles.

With this in prospect, the Gillette Publishing Company launched the magazine *Caminos y Calles* (later *Caminos y Construccion Pesada*) in 1941, and *World Construction* in 1947; and at the same time began issuing an annual equipment catalog affiliated with each.

In 1950 *County and Township Roads* was launched. Not long afterward its name was broadened to *Rural Roads*, and its circulation has

also been broadened. It may surprise some of our readers to know that the latter and *ROADS AND STREETS* have a combined circulation of about 71,000 with only about 10% overlap. The combined circulation of "*Caminos*" and *World Construction* is about 27,000 with negligible overlap.

Good Roads, founded by Emmet Powers in 1892, was the first American magazine devoted entirely to highways. Its merger in *ROADS AND STREETS* is mentioned in our masthead as giving us 64 years of continuous publishing in the highway field.

Although this company is no longer a publisher of engineering books in general, the federal government assigned to us the publishing of its *Technical Glossary of Highway, Bridge and Soil Engineering Terms* in English-Spanish and Spanish-English. It was written by the U. S. Bureau of Public Roads, and recently released for publication after international conferences with Latin American officials.

The last 50 years of American road designing and building history make Rome's highway history for 500 years look insignificant, but what will our next half century make the last half century look like?

Westchester Parkway to cost \$65 million

Westchester County, the suburban area between New York City and Connecticut, is the scene of one of the world's worst traffic problems. Its famous parkway system, once design models, years in advance of other areas, are now outmoded and outgrown. The New York State legislature is to be asked to establish the Westchester Parkway Authority to plan and finance a \$65 million reconstruction program. This program would involve the 15-mile Hutchinson River Parkway, the 6-mile cross-county parkway and a portion of the Saw Mill River Parkway.

Political angles involved here include the question as to whether the proposed authority would be in conflict and competition with the New York State Thruway Authority which has two legs of its system penetrating this area into the fringe of New York City.



- (Left): Commercially built Finn Hydroseeder, with long distance nozzle which gives a carry to 100 ft. (Right): Hydroseeder using curved ribbon nozzle and traveling at 5 mph, puts down pattern of seed and fertilizer for distance 25 ft. out from road edge.

Virginia Experience with Mechanical Seeding-Fertilizing and Mulching

VIRGINIA Department of Highways personnel have long pioneered in the development of mechanical labor-saving methods.

One of the methods which they are quite enthusiastic about, is the mechanical seeding, fertilizing and mulching of right of way. This method is employed not only on new construction, but on maintenance work.

In 1949, the department constructed a hydraulic seed sprayer similar to that illustrated in Fig. 1. Since then the department has constructed a total of six of these sprayers in their own shops, the latest model being that pictured. Use of this equipment has been so successful that they have recently purchased two commercially built "Finn Hydroseeder."

On new construction mechanical mulching is also employed. Department specifications are being amended to allow the use of this method on

new construction work. One contractor, A. B. Burton Co., Lynchburg, Va., has already purchased and used this equipment for seeding and mulching all slopes of the approaches to the Carter Glass Bridge at Lynchburg. This contractor reports that use of this method resulted in savings of 60% over former methods used.

On new construction work, 900 to 1000 gallons of water are mixed with fertilizer (type and quantity depending on location and soil condition), and 40 to 80 lb. of seed, generally Ky-31 Fescue. This mixture will cover one acre. This application is from 60 to 70% effective and must be followed by a second application the following year. Approximately 50% of the original quantity of seed and fertilizer are required, but additional mulch is usually unnecessary. When lime is required the necessary amount is incorporated in the original solution.

On all slopes the seeding operation is preceded by mulching. Generally straw is used for mulching and the action of the blower tends to chop part of the straw into short lengths. The mixed lengths form a more closely knit mulch than straw spread by hand.

As the mulch leaves the blower stack it is jet sprayed with an emulsified asphalt. The emulsion holds the mulch in place and provides an effective tie-down against wind, rain, and traffic. From 40 to 200 gallons of asphalt emulsion per ton of mulch are used.

On maintenance work the seed sprayers are used for re-seeding and fertilizing as well as spot seeding. Depending on location, some areas of the state require frequent, even annual, fertilizing. Where this operation is necessary, approximately 10 lbs. of seed are mixed with the slurry. First priority in the use of this equipment is given to the mountainous and hilly areas, where there are many steep cuts and fills. When this equipment is available it is also used for seeding and fertilizing roadsides on more level terrain.

Although they have not been in operation long enough to reach a final decision, it is believed that the commercial seeders will provide greater utilization of equipment. The state-built seeders are installed on trucks with self-contained tanks requiring frequent stops or delays for refilling. The commercial units are on trailers and may be towed behind tank trucks. With the use of two or more skid mounted tanks in dump-bodied trucks, the operation of the seeder is continuous.

AMERICAN ROAD BUILDERS ASSOCIATION
— 54th Annual Convention and Highway Materials and Supplies Exhibit, Municipal Auditorium, Miami Beach; January 11-14, 1956.

- Figure 1. Virginia's hydraulic seed sprayer, mounted on a flat-bed and attached to the power take-off. Tank capacity, 750 gal. Water is pumped into tank, fertilizer and seed added. Constant suspension is maintained by a mechanical agitator, with separate motor power. Amount of water desired may be adjusted automatically. Tank can be filled in 10 min. using vacuum pump connected with engine at point where truck brakes and windshield wiper are connected. Spray nozzle is a 1½-in. pipe flattened to rectilinear 3/16-in. opening. Hose is stored in gutter-shaped trough fastened under bed of truck. Mounting ladder also serves as safety gate when the truck is in motion.



Briefly Noted . . .

Labor and material prices likely to prevail during the months ahead will be such that contractors should bid at least 18% higher than in the recent past.

This is the counsel given by the Virginia Road Builders Association to its members. The same advice would fit with minor variations in many other parts of the country. Unskilled labor moves to a higher minimum on March 1 and this is likely to stimulate higher wage rates in the skilled grades. Steel prices advanced "across the board" last summer, were recently boosted again for cold rolled strips, and other steel producers have posted increases for selective items.

Other materials will cost more because of increased labor costs and steel prices involved in their production. Ditto for equipment in some instances.

The Virginia Association's slogan is a good one: "Let's get tomorrow's prices for tomorrow's work." Always a nice try.

The efficiency of any large organization cannot be greater than that of its top management. This fact, long recognized in industry, is coming to the fore in the running of our growing highway building agencies. And it is about time, for the history of the state highway departments is shot through with some dismal records of inept or so-so management, along with brilliant examples of the high efficiency that can be obtained even in a tax-supported bureaucracy.

An excellent paper on management principles and the hiring, training and directing of men was given as part of the Texas Highway Short Course this past year.

Notable also was the recent three-day management conference held by the Corps of Engineers at the Engineer Research and Development Lab-

oratories of the Corps at Ft. Belvoir, Virginia.

This three-day conference was marked by the appearance of acknowledged leaders outside of the field of construction, as well as speakers from within the ranks of the Military agencies.

Contractors who had highway projects in Kentucky during 1955 were given a 40-day extension by the Department of Highways due to the exceptionally bad weather earlier in the Summer. The extension was granted after studying data compiled by the department's field engineers, the Kentucky Turnpike engineers and the Kentucky Association of Highway Contractors.

Which raises a basic question in highway construction management. Contractors who are always asking to have result specifications, and pleading that private initiative should hold full sway in road construction, might conceivably prefer that they be allowed to gamble on the weather and pay penalties for failure to complete within a specified time. Under a really tough highway administration, which would hold contractors strictly to their bargain, would this result in more road construction per dollar of public funds, or less?

Several hundred civil engineers, sitting at the highway luncheon at the ASCE annual meeting recently in New York, got quite an inspirational lift recently.

The person who did it was Enoch Needles, President-elect of the Society. This well known consulting engineer and leader in turnpike construction, pondering what is ahead for the civil engineer and the builder,

challenged those present to give their imaginations greater sway. In this day of swift change and tremendous developments, an unbridled imagination rather than statistical prediction is needed to estimate the new plateaus of technical accomplishment, said Needles.

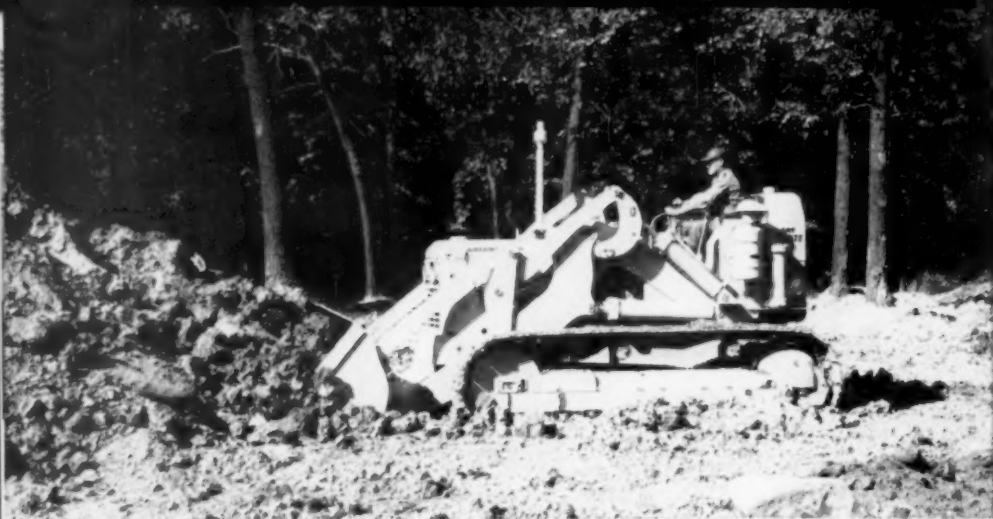
This speaker prophesied a brilliant future of living, in which the civil engineer will play an increasingly vital part. With the help of greatly expanded research, he expressed hope that we will eventually solve some of our most baffling problems, such as transportation in and out of cities. And enroute to this happy accomplishment, perhaps we will perfect revolutionary new pavement types and solve such basic problems as rust prevention for structures. New materials, new processes, new equipment, new engineering techniques will be the order of the day.

Coming from an impractical visionary person, such remarks as these would mean nothing. But when uttered by a practical leader such as Needles, they take on meaning for us all, as we start a brave new year.

Watch a battle shape up over problems related to that 2400 miles of newly designated interstate routes near and through cities. This small dab of mileage, which brings the interstate system up to the full legal limit of 40,000 miles, is the most costly part of the highway work ahead.

With \$3 or \$4 million a mile needed to build these segments, totalling some \$10 billions, the apportionment picture will be thrown off balance in favor of the heavily populated states. States such as New Hampshire with only one mile of new interstate route and some middle western and western states may have something to say on this subject.

IT COSTS LESS TO BUILD GOOD ROADS THAN TO HAVE POOR ROADS



1

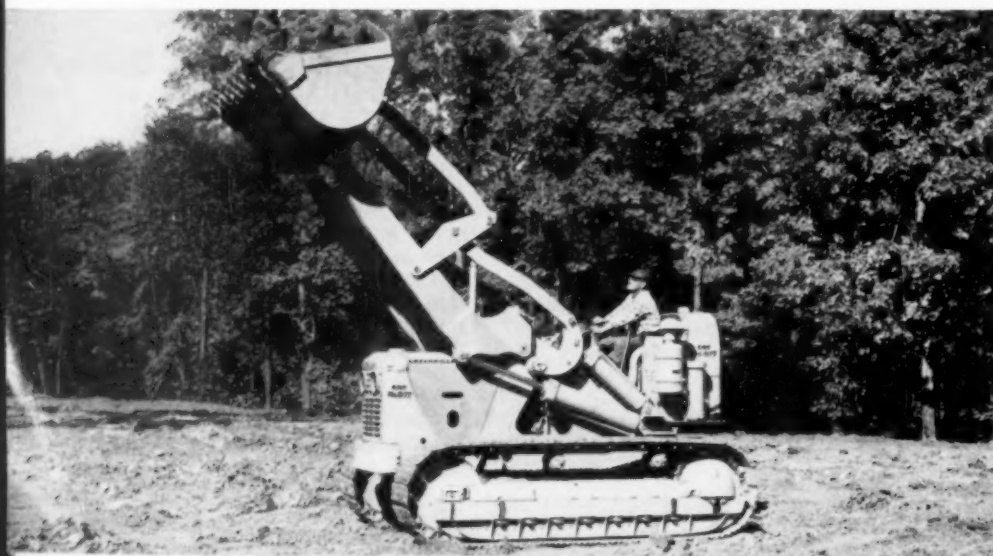
Ample power
and traction to
"bury" the bucket.

CATERPILLAR ANNOUNCES THE NEW NO. 977

Here's the new boss of the excavator-loaders...the new Caterpillar No. 977 Traxcavator. The No. 977 has important new features which greatly increase productivity and earning power.

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- 96-in., 2¼-cu.-yd. bucket.
- 100 HP CAT® Engine, with ample power to "bury" the bucket and lift big loads.
- Newly-designed bucket tips back 40° at ground level to retain heaping loads.
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- Steel bumpers on lift arms allow rapid jarring of bucket, and 50° discharge angle helps to empty sticky materials fast.
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- Advanced hydraulic system, with pump protected by full flow filter.
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- Fast, one-hand bucket operation. High seat for comfort and visibility.
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- Each track controlled by heavy-duty dry multiple disc steering clutch and contracting band brake.
- Tools for any job: 3-yd. bucket for light material; 9-tooth quarry bucket; heavy-duty bucket; skeleton rock bucket; log and lumber fork.



3

High lift,
with over 11½ ft.
of dumping height.

2

40° tip back
at ground level
to hold load.



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Please send full information about the new No. 977 Traxcavator.

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4

Fast, sure
dumping of sticky
materials.



How Did We Do in 1955?

A "mixed" year, with disappointments — but road construction still climbed 16 percent. Continued rise in road and street expenditures assured in 1956 from present revenue sources, as Congress forces new try at real long-range congestion-busting highway program

ROADS AND STREETS Staff Review

By Duane L. Cronk

THE highway construction industry looks back on Year 1955 with mixed sentiments. In the recent history of American roadbuilding it will probably stand out as the year of "The Great Disappointment." In 1955, the 83rd Congress, admittedly well-aware of the urgent need for a national highway program and given a choice of several fairly good financing plans, wrangled for two days and then turned thumbs down on all of them.

The highway industry, expecting action that would spark a ten or fifteen year boom in business, was stunned. The motoring public, primed with high hopes for new highways, was dismayed. Newspaper and magazine editors fumed in exasperation. Congress shrugged its shoulders and adjourned without a hint of what it would do about the national traffic jam in 1956.

Fortunately, there was more to 1955 for roadbuilders than the first "go-round" in the drive for a larger national highway program. The other side of the ledger reveals a year of noteworthy progress in other areas — achievements that, considered in total, add up to a good year. They are worth reviewing:

First, even without the expanded program proposed to Congress and without the 50% boost in federal-aid matching funds scheduled for use this year and next, roadbuilding hit a

record high. The forecast made by the Bureau of Public Roads last July that highway expenditures would hit \$7.2 billion has proved to be a sound one, BPR officials say. New construction reached \$4.6 billion, a 16% increase over '54.

Second, although Congress petulantly dismissed several financing proposals for a national highway program, there was little debate about the size of the schemes recommended. Federal aid until now has been meted out in millions of dollars; in 1955, the talking moved into multi-billion-dollar figures. Recognition of highway needs has reached a new "plateau," thanks primarily to the boldness of the Eisenhower "grand plan." And like the contestants on a popular television program, the advocates of adequate roads may miss the \$64,000-question, but they won't get away without at least a "Cadillac" of a federal-aid program, many observers now believe.

• Meanwhile, the states actually set the pace for a good year in 1955 (and the years to follow) by aggressively promoting substantial construction plans. Of the 47 legislatures that convened during the year, 14 boosted the gasoline tax, thus providing a total of \$154-million more for highways. Fifteen states authorized bond issues totalling \$896.8 million for road work and many liberalized the debt limits

of cities and counties so that they could float bond issues for local street and highway jobs. Seven states created toll road authorities or approved specific turnpike projects. Twenty-one others boosted registration fees, and several delineated long-range roadbuilding programs in other ways.

The major set-back on the state level was the defeat in New York State of a proposal to borrow \$750 million for highways. But the sum total of state achievements was one of the most encouraging highlights of 1955. Three more states approved constitutional amendments (so-called "Good Roads Amendments") to prevent diversion of highway revenues.

• The toll road movement continued apace in '55. Connecticut last month marketed a \$100-million worth of bonds for continued work on her \$398-million cross-state turnpike. Florida approved construction of the \$207-million Fort Pierce to Jacksonville facility. Illinois marketed \$415-million worth of toll road bonds for several toll roads. The Pennsylvania legislature authorized a second 360-mile toll pike across the state which would cost an estimated \$630 million.

Altogether, some 12 states authorized such projects, totalling \$1,158 million, and toll road agencies sold \$800 million worth of bonds for new projects last year.

• Dozens of urban expressway projects, long in the planning stage, got a "shot in the arm" in 1955 when the Bureau of Public Roads designated them as segments of the National Interstate System. Some 2,300 miles of urban projects in 102 communities will now receive 60% of their cost from the Federal government. There is considerable pressure on Congress to delegate financial responsibility for 90% of the cost to the federal government. If that occurs, such projects can easily become a significant portion of the annual roadbuilding "market."

• There was unusually high public interest in highway needs in 1955. Good roads proponents turned out a veritable flood of publicity on the highway problem, much of which appeared in the largest circulation magazines and newspapers. The greatest persuader of all — congestion — continued to increase, pointing up the obvious need for new facilities. An estimated eight million automobiles rolled off the assembly lines in 1955, adding noticeably to nearly intolerable traffic conditions in some localities.

Automobile manufacturers, particularly worried about the diminishing utility of their product on crowded streets, swung their weight behind such publicity campaigns as "Highways for Survival." The U. S. Chamber of Commerce conducted a series of regional conferences to rouse businessmen to the economies of good roads vs. poor roads, and other organizations drummed up public interest on a variety of fronts. Such activities, creating public awareness of highway needs, must be included as intangible accomplishments in any appraisal of 1955.

• The year was not without operating problems within the industry. Shortages of cement in a number of areas harassed contractors. A continued lack of engineers challenged the resourcefulness of highway organizations, and stimulated the advancement of several technological devices to ease the manpower shortage. Departments gave more attention to building a corps of sub-professional engineering aides. Many turned to consulting firms to ease their staff load.

The uncertainty over what Congress would do about a national program led some public officials to sit on long-planned projects. The American Municipal Association declared in October that 85 cities were unwilling or unable to tackle some 129 specific projects until they learned whether Uncle Sam would boost the federal share of the cost. The delay was hard

on planners and roadbuilders alike.

• 1955 was the first year of the Secondary Roads Plan, an attempt by the Bureau of Public Roads to ease out of some responsibility for federal-aid secondary system projects. Thirty-four states came under the voluntary plan in '55, eliminating the need for the bureau to approve plans, specifications, and progress.

Analysis of data from the WASHO Road Test, an experiment to determine the effects of various truck weights on various pavement structures, was completed last year, and final agreement was reached for conduct of a much larger \$8-million AASHTO road test in Illinois. Other achievements in the field of research included the formation of a National Committee on Urban Transportation and a \$150,000 study of state, county and city highway legislation. The urban transportation group is setting up procedures for making surveys of municipal street and highway needs similar to those undertaken by the state highway departments during the depression.

• Highway construction costs on federal-aid projects during the first three quarters of 1955 were running only 0.6% over the same period of 1954. Components showed these increases or decreases (national averages):

Common excavation	No change
Concrete pavement	Up 1.5%
Structures	Down 0.7%
Reinforcing steel	Down 1.4%
Structural steel	Down 6.6%
Structural concrete	Up 0.9%
Composite mile	Up 0.6%

Congress revived the National Airport Program in '55 by authorizing \$252 million worth of federal aid to be matched over a four-year period by the states. There is considerable paving work for highway contractors in the projects thus made possible.

ASTM cement standards

ASTM STANDARDS ON CEMENT (With Related Information). (C-1), October, 1955. 273 pp, 6x9, Heavy paper cover. This compilation covers the various ASTM standards and tentative specifications, methods of chemical analysis, and methods of physical testing pertaining to cement. Substantially revised since the edition of May, 1954. Of the 37 specifications and tests, 18 have been revised and 5 are new. Two methods published in the previous edition have been discontinued and incorporated in "Methods of Chemical Analysis of Portland Cement (Tentative)," (C

The Toll Road Scoreboard

As 1956 rolls around, the toll road boom continues to provide a big chunk of the highway construction volume.

• Today, almost 1,712 miles of toll roads have been completed in 12 states at a cost of \$2,285,328,000.

• Another 1,515 miles are under construction in 15 states. They will cost \$2,582,586,000.

• Projects costing an estimated \$4,556,158,000 and totalling 3,633 miles, have been authorized in 20 states.

• Projects costing an estimated \$1,290,860,000 and totalling 1,335 miles have been proposed in 9 states.

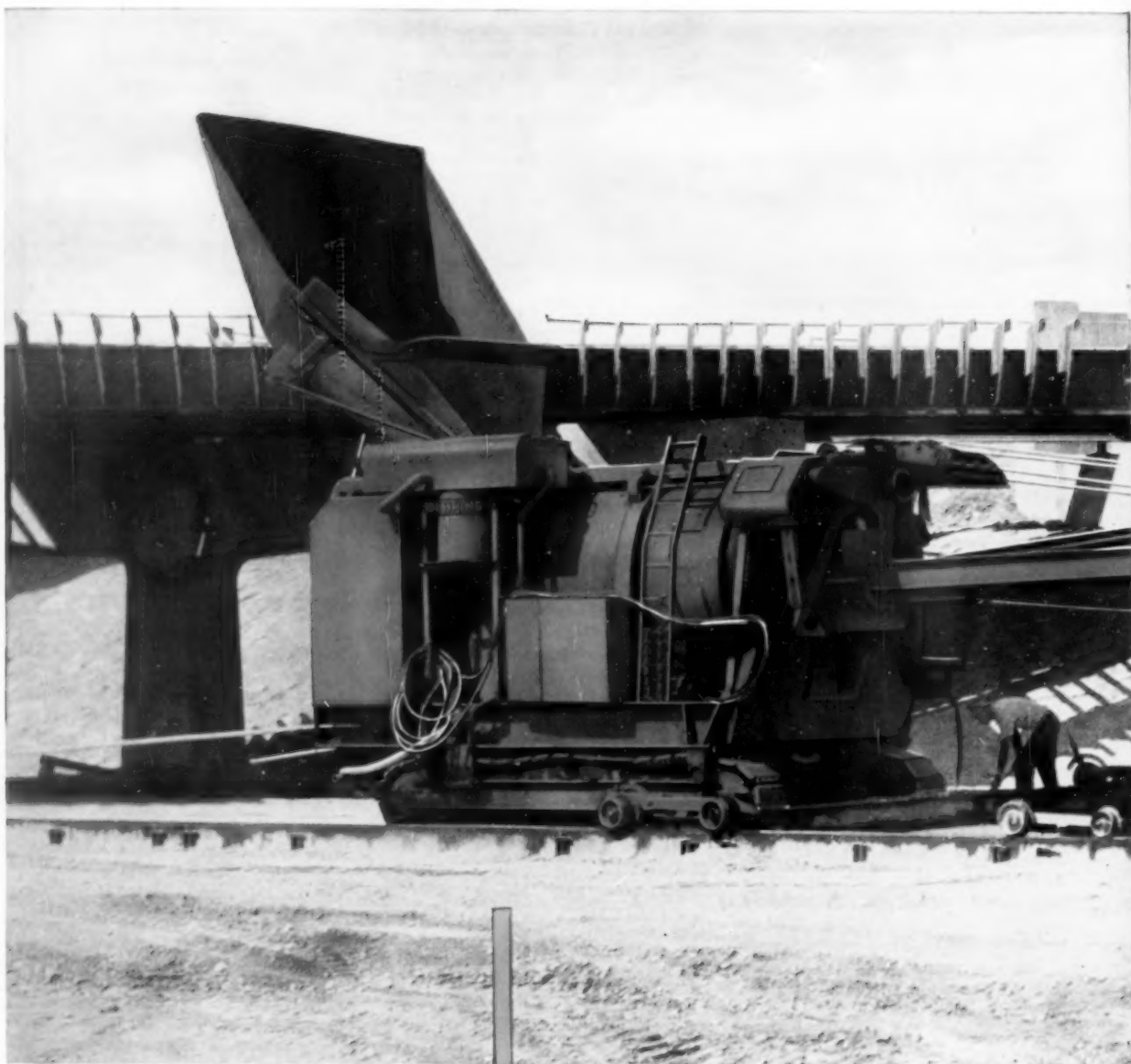
These figures are from a detailed tabulation compiled as of Nov. 1, 1955, by the U. S. Bureau of Public Roads.

114 — 51T). Discontinued are: "Method of Test for Sodium Oxide and Potassium Oxide in Portland Cement by Flame Photometry (Tentative)," (C 228 — 49T) and "Method of Test for Time of Setting of Hydraulic Cement in Mortar (Tentative)," (C 229 — 52T).

Four appendices relate to Analytical Balances and Weights, Manual of Cement Testing, Selected References on Portland Cement, and the Principle of the Methoxyl Method for Determining Vinsol Resin in Portland Cement.

The standards in this compilation have been formulated by ASTM Committee C-1 on Cement and are of great value to all cement manufacturing plants, and laboratories engaged in cement testing. Committee C-1 is one of the Society's oldest committees, having been organized in 1902. The book, one of a series of special compilations of ASTM standards relating to specific materials fields, may be obtained from ASTM Headquarters, 1916 Race St., Philadelphia 3, Pa., at \$2.75 per copy.

• A low-bid contract of \$7,401,331.50 for construction of about one mile of parkway in Quincy as part of the Southeast Expressway has been awarded to Savin Construction Corporation, of East Hartford, Conn., by the Massachusetts Department of Public Works. Savin is a division of Merritt-Chapman & Scott Corporation's Construction Department.



Reserve production
capacity gains

**40 EXTRA
BATCHES
A DAY**

Koehring 34-E twinbatch[®] paver

hits a top output of 86.7 batches an hour, on 60-second mixing cycle. It maintains high average batching speed because — with twinbatch Autocycle mixing — there's plenty of reserve production capacity when you need it to offset normal job delays. This lets you pick up lost time which cannot be made up with limited-production single-drum pavers. For example:

A single-drum paver theoretically mixes up to 50 batches an hour, but usually averages only about 45 batches due to normal production delays. Under identical job conditions — and with the same set-up of auxiliary equipment — Koehring 34-E twinbatch easily averages 50 batches an hour, 8 hours a day. You gain 5 extra batches an hour

New super-highway in the Mid-West is paved by a Koehring 34-E twinbatch. On this job the paving contractor also used a Koehring Longitudinal Finisher to keep pace with the high-production 34-E twinbatch.



over the single-drum paver — 40 extra batches a day. Yet, it requires only about 3 extra batches a day to offset the slight additional cost of a 34-E twinbatch paver. That leaves a net gain of 37 extra batches per day to help maintain schedules, complete more jobs per season, and earn more profits per job.

No expense for extra equipment

You get this extra paver production with no additional investment in auxiliary equipment. By maintaining 50 batches an hour, the Koehring 34-E twinbatch keeps your present batch plant, hauling and finishing equipment working at maximum efficiency. What's more, this increase over single-drum paver production requires no extra paver operating expense, service or maintenance. The 34-E

... for more details circle 211, page 14

ROADS AND STREETS, January, 1956

twinbatch is as simple as a single-drum machine. Basic units are the same, except for the double compartment drum — and, the Koehring 34-E is easier to operate because, with twinbatch Autocycle control, every mixing operation is automatic, accurate and fast.

You'll be miles ahead on your highway, airport and other big-production paving contracts with a Koehring 34-E twinbatch paver. Better see your Koehring distributor about it today, or write for bulletin. Also look into the mobile, rubber-tired 16-E twinbatch for smaller jobs.

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High Gravel Production in a Wet Pit

Rains on Ohio Turnpike area failed to stop production of base-course materials by this contractor, who "souped up" his crushing plant and adjusted its components to offset excessive moisture.

DURING the past summer tension ran high on the Ohio Turnpike project, as the October 1 deadline neared for opening this 241-mile road to traffic. Wet weather whenever it occurred was a cause of concern, because of the tight schedules.

One contractor serving Contract Sections 11, 12 and 13 had more than his share of problems, due to wet weather and excessive moisture in his gravel pit. This company was that of W. J. Menefee, of Sedalia, Mo.,

who produced base-course aggregates for Western Contracting Corporation, of Sioux City, Iowa, and R. J. Potashnick, of Cape Girardeau, Mo., in supplying their segments totaling 14 miles of turnpike. Despite rains and a serious problem of excessively wet pit conditions Menefee achieved a rather remarkable performance by "kicking" his plant up to 450 tons per hour.

Not once did rain or ground moisture stop production in this base ag-

gregate operation while grade crews were able to operate.

Menefee's subcontract was for production of 230,000 cu. yd. of material for subgrade blanket. This layer in the Ohio Turnpike design extends the full grade width and has a depth of 5 in. compacted beneath the portland cement concrete pavement.

Plant Speed Boosted

In June, 1954, the Menefee Co. bought a new Pioneer 35-S Duplex gravel plant which it has used exclusively in its 1954 and 1955 production. With plant the Menefee firm kept going at high speed despite conditions by doing two basic things. It utilized to the utmost the flexibility and versatility of the plant in normal operation. And it went farther by working a few special tricks. For example, when the material was exceptionally wet, the entire crushing operation was thrown on the 10x36 jaw crusher, allowing the 30x24 AFB roll crusher to run idle. This action saved clogging or choking of the roll crusher, and for some peculiar reason under these conditions turned out a well-graded, crushed product which dried up the over-all product so it had more nearly optimum moisture content. The result was a much better compaction job, with an increase in productive hours of spreading and rolling.

The plant's speed was raised without any evidence of mechanical harm. For example, the input belt was raised to 350 ft. per min. The gravel speed on the driveshaft, leading from a Caterpillar D338 diesel, was boosted to 1,100 rpm. The cycle vibration on the screen was boosted from 1,050 to approximately 1,200. Impacts on the jaw crusher were stepped up from 250 to 350 per min. In other words, the entire plant was "kicked up" to

- Heavy capacity of everything in the plant is shown in this photograph as material travels up the conveyors through the plant and into waiting trucks in the background.





● The muddy road in the foreground tells an eloquent story of conditions which the Pioneer 35-S Duplex plant whipped.

handle about 25 percent more material than its capacity rating.

The result of these changes was convincing proof that modern rock production equipment like the 35-S Duplex plant has a high reserve capacity. According to general superintendent "Red" Moore, and plant superintendent Elmer Midkiff, the machine was down less than four hours in the calendar year of use. Wear on the roll crusher was negligible, even though the rolls were used extensively for about five months when the plant was new. And the plant has produced 180,000 cu. yd. of material on its first set of jaws. Four sets of feeder conveyors have been used in that period. The only other concession has been the use of a special lubricant in the plant which has successfully prevented a single bearing from even running warm. This lubricant is Sinclair's Modoc dark steam cylinder oil, which comes from the refinery with No. 23 filler mixed in. According to Menefee's officials, it has done as good a job as the plant.

Straightest Pass

In passing the material through the plant, Menefee used a system which routes the pit-run rock in as straight a pass as possible to the haul-away trucks. For example, the set-up pictured here was made at a pit site north of Revemma, along the south side of the new turnpike. An excellent natural deposit of glaciated gravel and sand was located here, with material ranging in size from No. 200 mesh to 12 in. cobbles. The presence of cobbles in the 3 to 4 in. diameter range gave a crushing ratio of about 80 percent. This was just enough

when wet conditions developed to help effectively in drying up the mix.

Two Caterpillar D8's with U-type dozer blades moved pit material to a continuous apron-type feeder located at the bottom of a trap. The feeder supplied an 8-in. deep course of raw material on the revved-up 30-in. feeder belt. The belt was powered by a diesel engine operating through a torque-converter clutch, filled with SAE 40 driving oil. The sprocket ratios were 20 in. to 10 in., which coupled with the cushioning effect of the torque converter, has made an excellent input set-up.

When the pit-run material reached the top of the plant, it moved by carrier belt over a 4x12 ft. screen deck. For turning out the 2½-in.-minus base course product required on the Ohio Turnpike, only one deck was needed. The bulk of the material dropped immediately through this screen,

which vibrated at 1200 cycles per min. and passed the material down through a small surge hopper to the stacker conveyor.

An unusual handling of the over-size material retained on the 2½-in. screen deck tended to boost plant output under these conditions. It also gave the engineers a better compaction job, lessened segregation. From the vibrating screen, the plus 2½ in. material was routed into a 10x36 jaw crusher, set at 2 in. clearance. The jaw crusher was operated in close circuit with the screen deck, so that crushed, dry particles coming out the bottom of this machine returned immediately to the screen deck, where they blended with the other material and tended to dry the mix by at least several percentage points. In wet weather — and there was plenty to contend with — this was a decided advantage.

(Continued on next page)



● Showing the aggregate plant in relation to the feeder trap.



● Traffic as usual during construction. Perforated vitrified pipe being installed.

In a Wet Pit (Continued)

After being mixed with the incoming material, which normally passed through the screen without crushing, the material then was carried to stockpile over a 36-in. stacker. This belt moved fast enough to get an 18-ton load out in about one minute 40 seconds. On an 8-mile haul, with four of those miles over concrete, the plant often produced so fast that it took 35 dump trucks to keep up. On the basis of straight tonnage, the common measure used by most state highway departments, the plant was regularly turning out 450 tons per hour and was hitting peaks beyond that. Measurement on Ohio Turnpike, however, was based on cubic yards, and on that basis, according to "Red" Moore, a normal day's work for the plant was about 3,500 cu. yd. (bank measurement) each 10-hour shift. The excellent compaction required on Ohio Turnpike resulted in a solid in-place measurement of 2,800 cu. yd. per day of completed base.

"We've had hardly a minute's trouble here under some of the toughest screening conditions I've ever seen," explained Moore. "What it would do under conditions more ideal than they are here, I wouldn't even guess. I can say, too, that part of the credit for our production under these conditions should certainly go to the adjustability feature. It was always easy for Elmer to tighten up his jaw crusher and loosen up the rolls anytime the pit got wet. Under dryer conditions, of course, we'd use the rolls."

By continuing to operate the plant in all weather, Menefee contributed more than his part to speeding the paving work on his three segments of the Ohio Turnpike, which opened to traffic October 1 as scheduled.

DONALD S. BERRY, formerly Professor of Transportation Engineering at the University of California, Berkeley, has joined the faculty at Purdue University as Professor of Transportation Engineering.

At Purdue, he will coordinate the academic programs at graduate and undergraduate levels in the field of transportation engineering, as well as teach graduate work in traffic engineering, highway economics, and related phases of transportation engineering.

He will also work with the many graduate students employed in the Joint Highway Research Project, in the planning of their programs of graduate study in highway and transportation engineering.



● Barber-Greene ditcher trenching for roadside drains, which were installed at 15 in. depth. 30,000 lin. ft. total at a cost of about \$1.00 per ft.

Good drainage a feature of road widening job

Every highway engineer knows from his text book days that good drainage is the first essential in any project. But there is always the question as how best to apply drainage techniques for a given situation.

An example of a project in which the drainage was not forgotten is that pictured here. It is the widening and resurfacing of U. S. Route 20 covering 5.5 miles west of Erie, Pennsylvania. Fry Construction Company of Erie, was the contractor.

The improvement consisted of adding 18 ft. of additional width to the highway, bringing it to about 50 ft. between ditches. Faulty sections of concrete were torn out and new pavement installed and the pavement under-sealed with hot asphalt where necessary to fill voids and correct pumping conditions.

The widening consisted of 6 in. of bank gravel, covered with 9 in. of slag base and 3 in. of asphalt penetration. The entire widened surface was covered with pre-mixed bituminous material. One section, a length of 1.5 miles, remains a concrete surface and widening is with concrete.

The drainage system installed in connection with the work utilized semi-perforated vitrified clay pipe, with self-centering lugs molded in the bell of the pipe. The pipe required no mortar. Drainage lines were put about 4 ft. back of the pavement edge, beneath the gravel.



THE BUFFALO-SPRINGFIELD K-45 KOMPACTOR

How to select compaction equipment

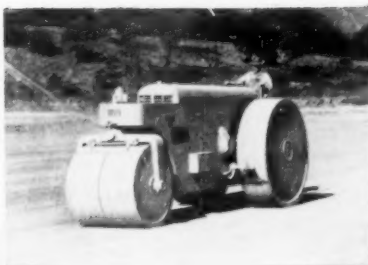
The logical question to ask yourself when you are ready to buy new compaction equipment is: "Exactly what do I need the equipment for and how will I use it?"

BASE FILL COMPACTION—This type of compaction demands equipment that will handle a wide variety of materials, give you the highest degree of compaction with the fewest passes. Buffalo-Springfield's revolutionary K-45 Kompactor is proving a real money-making answer for this type of work. It is self-propelled, relies on the "Interrupted Pressure Principle." All compaction effort is directed downward. Contractors testify they are meeting density requirements in one-fourth the time normally required with other compaction equipment.

FINE GRADE FINISHING—Buffalo-Springfield offers six 3-wheel rollers, ranging in capacity from 5 to 15 tons, to handle the large variety of materials found in fills, subgrades and unfinished bituminous pavements. The variable-weight 3-wheel roller is ruggedly built for years and years of hard, maintenance-free work.

Buffalo-Springfield's thoroughly-proved 3-axle tandem "walking beam" roller provides up to 60% greater tonnage compacted per day in superhighway construction, airport and military establishment jobs where specifications are extra strict.

ASPHALT FINISHING—Two-axle Tandem Rollers are designed especially for all surface finishing jobs. Ranging from 5 to 16 tons, Buffalo-Springfield Tandems are used for



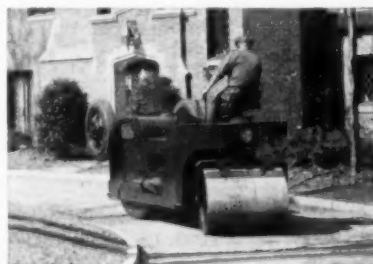
3-WHEEL ROLLERS

heavy-duty highway and public works projects, and all types of finishing, maintenance and repair work. A wide selection of models for the biggest to the smallest jobs are designed for long-life and profitable operation.



TWO AXLE TANDEMS

SHORT ROLLING JOBS—Buffalo-Springfield's 3-5 ton portable roller is widely used for rolling driveways, sidewalks, parking and playground areas, and for patching and light fin-



3-5 TON PORTABLE TANDEM

ishing jobs. It is highly maneuverable and portable from job-to-job. Write today for full information on the type of equipment you need—or see your nearest distributor for an on-the-job demonstration.

THE BUFFALO-SPRINGFIELD KX-3 AXLE TANDEM



... for more details circle 186, page 14

ROADS AND STREETS, January, 1956

The Standard  of Comparison

**BUFFALO
SPRINGFIELD**
SPRINGFIELD, OHIO

Job and Equipment Ideas



● Truck-tractor converted to service rig.

Truck-Tractor Service Rig

Highway contractors and maintenance agencies will find points of interest in the service equipment pictured here. Savings in man-hours have been accomplished by conversion of this International truck-tractor into a "portable" service shop at the Detroit terminal of Roadway Express, Inc. In order to speed up routine service checks of new diesel-powered International RD-205 Roadliners and 35-foot semi-trailers, Roadway compactly arranged all necessary tools on the International's extended chassis and placed it in service.

Before start of runs, tractor-trailer combinations are spotted in yard adjoining terminal. From "mobile" shop on duty there, mechanics check and repair trailer air and electrical systems, grease, check brake linings, inflate and change tires, pack wheels and perform other normal shop tasks.

In addition to the time-saving factor, according to C. D. Long, terminal manager, the practice also frees regular shop for other than routine service of other road units and eliminates traffic congestion around 32-door terminal.

Lock Up Blasting Caps

Blasting cap accidents to children numbered 190 in 1954, an increase of 58 over 1953, according to an article in the *Explosives Engineer*. While the number of blasting cap accidents to children is relatively small in comparison with other accident types, no child needs to be injured by a blasting cap.

It's up to mining companies, quarries, construction contractors, and

farmers to keep detonators locked up. Children often do not recognize them or realize their danger.

Blasting cap accidents to children have decreased over the years. Let's maintain the downward trend. The Institute of Makers of Explosives supplies motion picture films, posters, and numerous other educational materials for training children and adults. These materials are available for the asking. Are the children and adults of your community awake to the hazard of blasting caps?

Cleats along shoulder warn driver on curve

Concrete cleats, embedded in the outer edge of the asphalt pavement, is an answer being tried by the Multnomah County Road Department, for a sharp road turn near Portland, Oregon. The accompanying picture shows a typical installation.

The road at this location is on a

grade, and passes through a heavily wooded area so that visibility is reduced at times. The cleats, painted bright yellow, are set approximately 5 ft. apart. Each cleat is 6 x 12 in., with a tapered design providing a $\frac{1}{2}$ -in. raise or bump. This safety device has been installed on several curves, being considered especially valuable at points where side roads come in in such a way that the driver is given a momentary false security because of the extra pavement width.

Safety cut-out device for air tools

From *Safety News Letter*, Construction Section, National Safety Council.

The Philadelphia Electric Company has many jobs where it is necessary to cut, drill, or break concrete structures, floors, and paving by means of pneumatically driven, manually guided tools, such as drills, paving breakers, and chipping guns. Frequently, electrical conductors, piping, reinforcing steel, and other materials are embedded in the structures.

To provide the required protection in these operations, a "Safety Cut-Off Device" was invented and patented by Messrs E. F. Sheehan and George V. Hunt of the company's construction division.

The function of this device is to automatically cut off the supply of air to the tool when the working point comes into contact with conduit, pipe, or any similar electrical conductor. In this way, the tool is stopped before it can penetrate the critical material.

As a part of this equipment, visual

● Raised concrete cleats designed to warn motorists on a sharp turn.



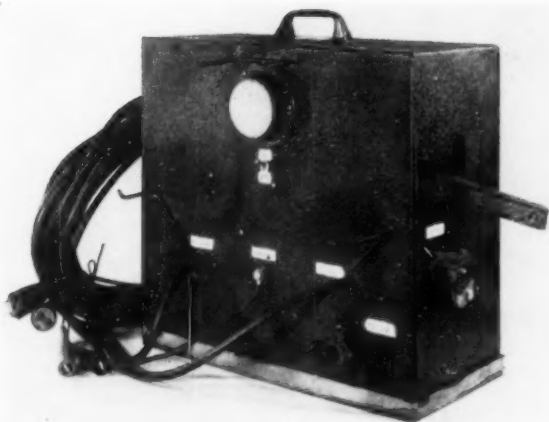


Figure 1.

Figure 1, shows the front panel with service points, reset lever, operating switch and signal lamp.

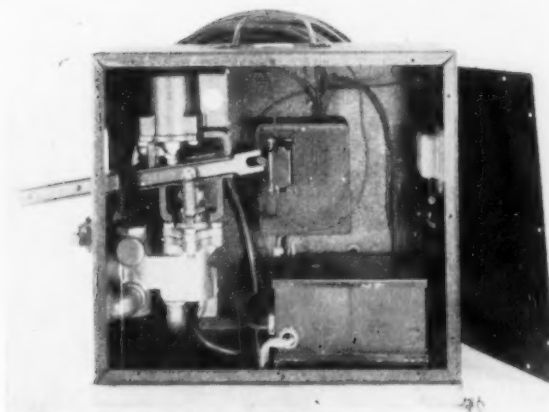


Figure 2.

Figure 2 shows the general arrangement of the equipment inside the case. These cut-off devices have been in service since 1946.

and audible signals, in the form of a light and a bell, are installed to indicate that the tool has been shut down by contact with an embedded conductor.

The case which houses the equipment is 17 in. wide, 15 in. high and 8 in. deep, and is conveniently transported from job to job.

New stabilization techniques suggested by research

Texas Engineering Experiment Station News, Vol. 6, No. 2, p. 13, June 1955. Highway Research Abstracts, October 1955.

The suitability of aluminum sulfate and iron sulfates as auxiliaries in bringing about satisfactory bituminous stabilization of soils has been affirmed by C. Kinney Hancock with data obtained in past experimentation in laboratories of the Texas Highway Department. Good results were obtained in additions ranging from 0.5 to 4 percent.

Of eight abnormally hydrophilic soils investigated, six yielded to satis-

factory stabilization and one to fair stabilization with RC-2 cutback asphalt and 0.5 to 2 percent FeSO_4 . With two of the soils a somewhat greater stabilizing effect was obtained with $\text{Al}_2(\text{SO}_4)_3$ and $\text{Fe}_2(\text{SO}_4)_3$. The smaller effect for FeSO_4 may have been to delayed atmospheric oxidation of ferrous ions to ferric ions.

The experimentation also showed that the salts had no direct stabilizing effect without asphalt. They act strictly as auxiliaries by altering the soil particle surfaces so that the soil may be stabilized with asphalt. Aqueous solutions of FeSO_4 and of $\text{Al}_2(\text{SO}_4)_3$ gave approximately the same stabilization in each case as their respective dry soils.

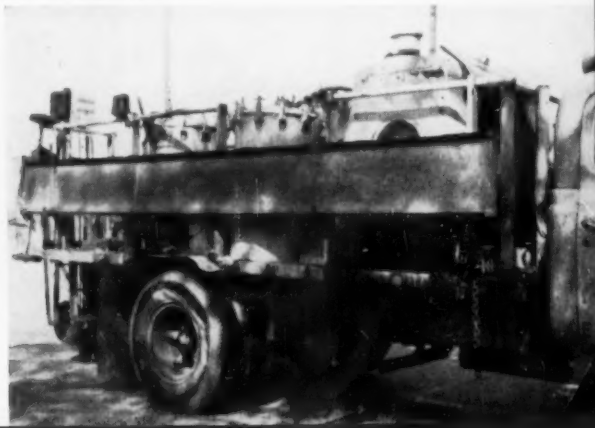
In general, the auxiliary action of all three of the salts is a result of equilibrium exchange and of the creation of positively charged sites on the soil particle surfaces which tend to make the soil more asphaltophilic and less hydrophilic. The final result is increased adhesion between soil particles and asphalt and this tends to increase the water resistance and load-bearing value of the soils.

An easily applicable plastic film only a few ten-thousandths of an inch thick has been developed by the Naval Research Laboratory. Polytetrafluoroethylene, better known by its trade name, "Teflon" and previously well established as a protective coating and electrical material, is the new lubricant. Used as a combination dry lubricant and corrosion preventative, it is servicable from 75 degrees below zero to 500 degrees above. Over this wide temperature range, "Teflon" has a coefficient of friction of 0.1 or less.

Fresh paint markers shunted to position

No, the playground is not being moved. Seems the boys in the line marking crew of a western Illinois district did not like the odor of the asphalt paint purchased this year. This paint, used in some locations in the spaces between the white lines, was unusually odiferous, making it hard on the men who rode the tail-gate to place signs on fresh markings. Result, they devised and built the "sliding-board on wheels" pictured here.

● Triangular markers are placed via this wheel mounted sliding board from moving truck.





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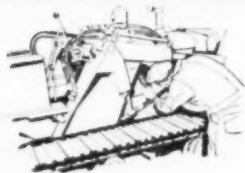
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Factory-trained servicemen are ready to help you, day or night. Their technical know-how and practical experience get the job finished fast . . . at lowest possible cost to you.



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. . . for more details circle 178, page 14

ROADS AND STREETS, January, 1956



● Contractor-built form pin pullers seen in action on a Wichita street project.



Labor-Saving Way to Yank Form Pins

PINS for steel curb-and-gutter forms are pulled at the rate of 1,000 feet of pins per minute by the pair of special pullers pictured here. The pullers belong to Richie Bros. Construction Co., of Wichita, Kansas, which does a large volume of residential street work.

Designed by Richie's paving foreman, Ted Ridder, the pullers each consist of a hydraulic cylinder converted to air operation and fitted with a pulling claw. The heavy steel plate claw is fastened to the lower end of the cylinder. The plunger with its bottom plate is rested on the concrete or ground next to a pin, and the claw inserted around the pin head. Air is turned on with a lever, and up comes the pin.

One puller can yank three or four pins a minute with ease, depending on how fast the operator is willing to walk between pins. Air is supplied by a small mobile compressor towed by a pickup.

According to the Richie Brothers the idea for the puller first came from seeing an article in *ROADS AND STREETS*, describing a heavy hydraulic puller which Texas Bithulithic Company had designed for pulling airfield form pins.* This earlier unit in turn, is known by the *ROADS AND STREETS* editors to have been inspired by a

similar device developed by Griffiths Company, as pictured in an issue several months previously.**

Richie's first puller, built early in 1955, has a 3-in. cylinder diameter and an 18-in. plunger. The second one has a 4-in. cylinder. With the two units, two men can load into a pickup, make the rounds covering many blocks, then turn to other assignments until the pullers are needed again.

Fabricating girders by submerged arc welding

Joseph H. Hoffman. *Welding Journal*, Vol. 34, No. 8, pp. 741-746, August 1955. Highway Research Abstracts, October 1955.

This paper describes the method of fabricating a 120' 6" welded-plate-girder span starting with the cutting to size of the plates, the jigs used for fitting and welding, the welding procedure using the tandem submerged-arc-welding process, shop changes to welding machine carriage to suit welding conditions and loading for shipment.

*CONCRETE PAVING METHODS AT ABILENE AIR FORCE BASE; *ROADS AND STREETS*, September, 1954 (p. 48).

**FREEWAY PAVING EMPHASIZES WESTERN METHODS; *ROADS AND STREETS*, December, 1953 (p. 25).

The details bring out the reasons for using the described jigs and fixtures, the difficulties encountered due to welding distortion and how they were overcome, and why the tandem submerged-arc-welding process was used instead of others.

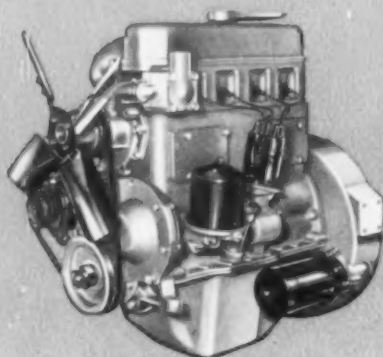
The tandem submerged arc welding has less shrinkage and distortion than shielded arc welding, and because of high rate of welding speed, uniformity, and high quality of weld, it seems to be the answer to this type of fabrication.



HERCULES *announces*

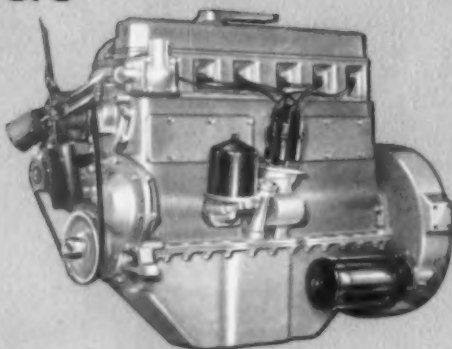
G. O. SERIES GASOLINE OVERHEAD VALVES

G. O. 4



Model	Bore Stroke	Displ. Cu. In.	Max. H.P.
G.O. 173	3½" x 4½"	173	67 @ 3200 R.P.M.
G.O. 198	3¾" x 4½"	198	76 @ 3200 R.P.M.
G.O. 226	4" x 4½"	226	87 @ 3200 R.P.M.

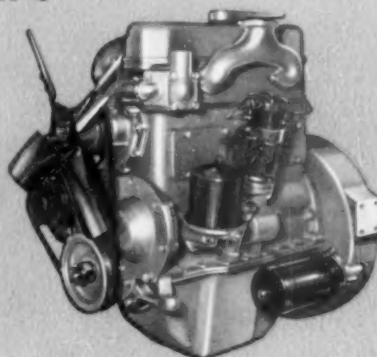
G. O. 6



Model	Bore Stroke	Displ. Cu. In.	Max. H.P.
G.O. 260	3½" x 4½"	260	102 @ 3200 R.P.M.
G.O. 298	3¾" x 4½"	298	114 @ 3200 R.P.M.
G.O. 339	4" x 4½"	339	131 @ 3200 R.P.M.

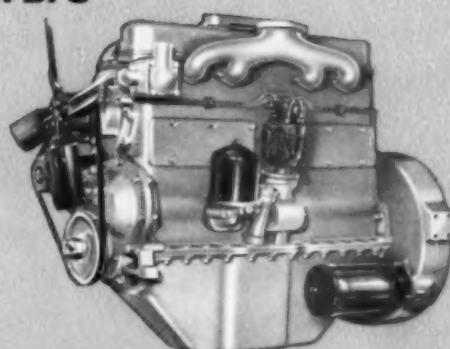
D. D. SERIES DIRECT INJECTION DIESELS

D. D. 4



Model	Bore Stroke	Displ. Cu. In.	Max. H.P.
D.D. 173	3½" x 4½"	173	50 @ 2000 R.P.M.
D.D. 198	3¾" x 4½"	198	57 @ 2000 R.P.M.
D.D. 226	4" x 4½"	226	65 @ 2000 R.P.M.

D. D. 6



Model	Bore Stroke	Displ. Cu. In.	Max. H.P.
D.D. 260	3½" x 4½"	260	75 @ 2000 R.P.M.
D.D. 298	3¾" x 4½"	298	85 @ 2000 R.P.M.
D.D. 339	4" x 4½"	339	99 @ 2000 R.P.M.



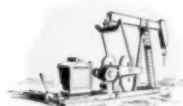
Marine



Construction



Material Handling



Oil Fields



Agriculture

NEW MODELS

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SAME

GASOLINE
L. P. G.
KEROSENE
NATURAL GAS

DIESEL

**MAJORITY
OF PARTS**

SAME

GASOLINE
L. P. G.
KEROSENE
NATURAL GAS

DIESEL

additions to the extensive line of HERCULES ENGINES

With the addition of these four new series consisting of 12 models, the Hercules Motors Corporation has increased its line of engine sizes and types to better serve the varied needs of the many different industries which require gasoline and diesel engines for their power requirements. This expansion of the Hercules line will enable manufacturers of end products to have a wider selection of engines and power units to meet individual requirements, all available from one dependable source.

Mounting dimensions of the new G.O. gasoline and D.D. diesel four cylinder engines are the same. The G.O. gasoline and D.D. diesel six cylinder engines are also interchangeable from the standpoint of mounting dimensions. Since this new series consists of parallel lines of gasoline and diesel engines,

they can be used interchangeably, if desired, in any end product within the recommended engine speed ranges. Further, these engines can be built with manifolds and accessory equipment on either side, as the cylinder blocks are symmetrical and can be turned end for end.

Another important feature of these new models is the great number of parts which are interchangeable between the fours and sixes, and also, between the gasoline and diesel. This greatly simplifies the parts and service requirements. The only essential differences between these gasoline and diesel engines are cylinder heads, manifolds, pistons and fuel handling equipment.

Further information on the G.O. and D.D. series may be obtained by writing the factory.

Engine Manufacturing Specialists Since 1915



Automotive

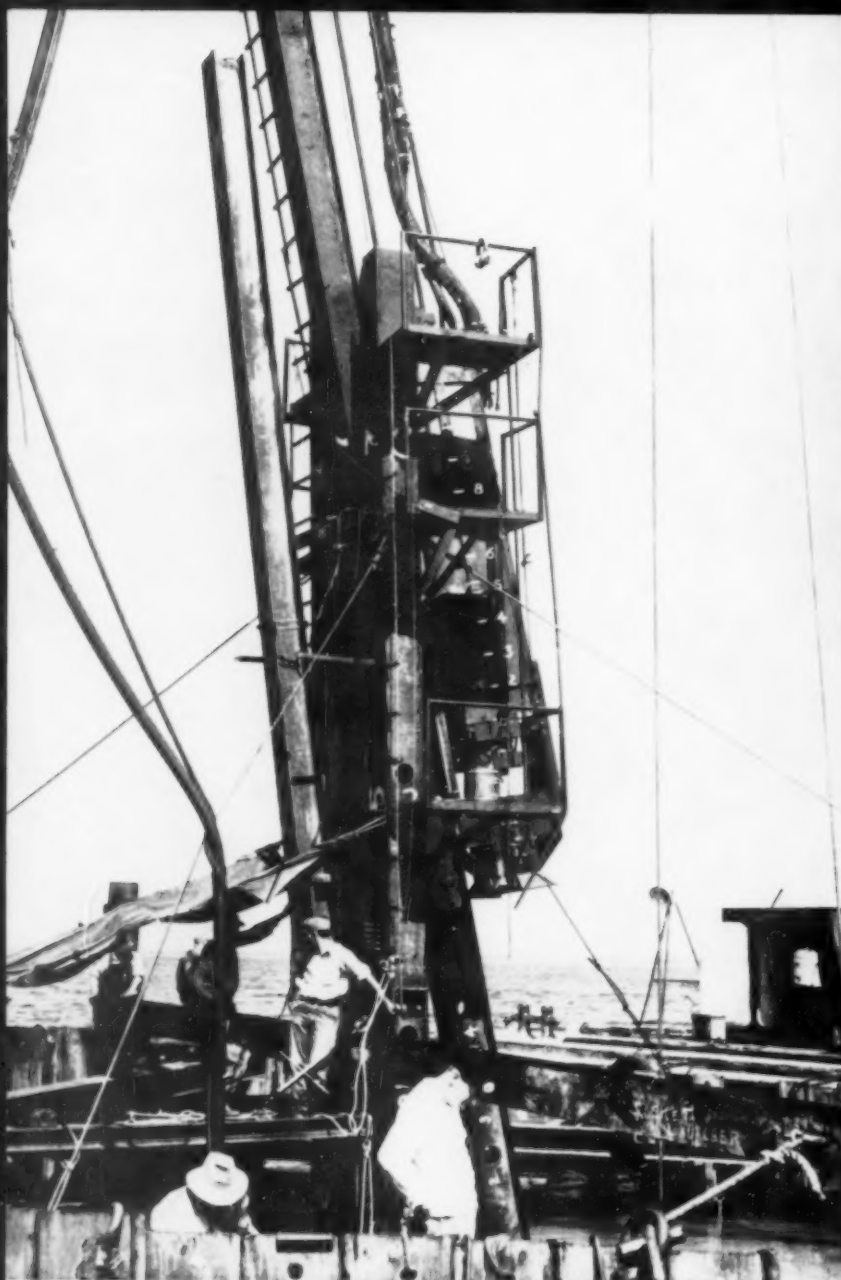


Road Building

**HERCULES MOTORS
CORPORATION**

CANTON, OHIO, U. S. A.

● Special pile-driving "Gizmo" used at Mackinac Straits Bridge. (United Press Photo.)



Pile Driving

"Gizmo" Creates Interest at Mackinac Bridge

THE news picture services recently picked up a snapshot of a device used by Merritt-Chapman & Scott Corporation in their foundation pile driving for the big suspension bridge at Mackinac Straits in Upper Michigan. This device, dubbed the "Gizmo," was designed especially to help drive a large number of heavy batter piles. It is a self-contained unit which rests on a king pile driven on the center of each cofferdam. The idea for it developed out of the need for an independent set of batter leads that would not rely on the weather for operation; as it turned out, weather had very little effect on its operation and in this respect, it was, therefore, quite successful.

The device is made up of structural members, pipe and plate with pin connections. Fabrication was a relatively simple matter. According to C. E. Haltenhoff, Project Engineer for Merritt-Chapman and Scott, a similar device could easily be constructed for any job where a suitable number of piles involving conditions similar to that encountered here are required.

At Mackinac Bridge, two derricks were employed in attendance, one holding the hammer, steam and air lines and the other placing the piles for driving.

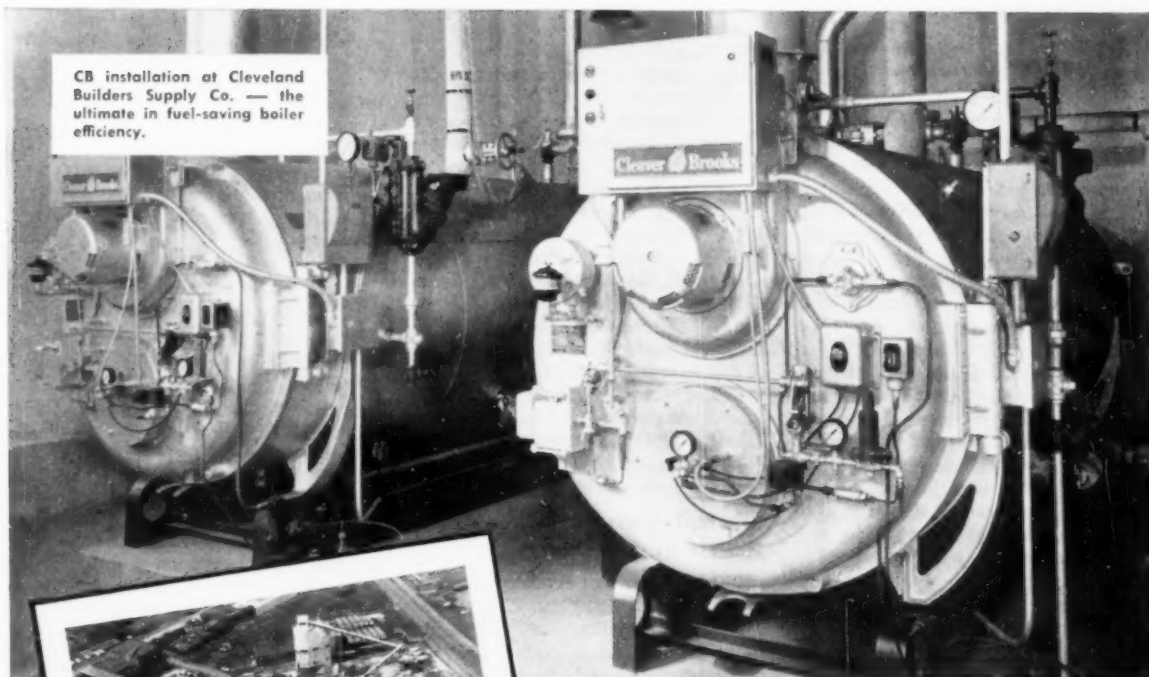
As described by Haltenhoff, "we had seven piers in total which had concentric rings of 117-lb. steel H bearing piles which were driven on a batter. Of these seven piers, five (the deepest) were driven with the use of the Gizmo. The remaining two (the shallowest) were driven with a hanging spud beam. As far as production was concerned, the maximum result was the driving of 17 piles approximately 130 ft. long in one 8-hour shift. This compares very favorably with the production on other jobs where similar pile patterns were encountered. One thing that the Gizmo did do was to insure the position of each pile in a uniform and accurate pattern."

In discussing the effectiveness of this device, Haltenhoff observed that it worked very well for his firm, driving a difficult pattern of piles very efficiently and economically. No comparative data are available since no other method of driving was used under similar conditions.

Keeping the water hot . . . for America's
first electronic ready-mix plant

A job well done by new CB boilers

CB installation at Cleveland Builders Supply Co. — the ultimate in fuel-saving boiler efficiency.



Aerial view of new plant. Control station is tower, garage and boiler house at upper left.

New Cleaver-Brooks CB boilers meet all heat demands for continuous, high-capacity, winter-time operations

PLANT "J" of the Cleveland Builders Supply Co. is the first to utilize the recently developed Butler electronic batching system. The firm sought to apply the absolute last word in technological progress in selecting equipment — for efficiency, compactness, flexibility and accuracy of control for concrete quality.

Installation of modern, oil-fired CB boilers in this entirely new plant — possibly the largest in the U.S. — was, therefore, a "natural." The twin 80-hp units provide all heat for winter operations, helping maintain the high-level 180-200 cu. yd. per hour schedule set up for the year.

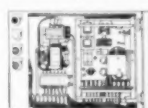
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New CB brings big boiler standards to users in the 15 to 150-hp class. Unit is years ahead in function, safety and appearance. Money-saving performance is proved on hundreds of installations! For complete details, write for new CB bulletin. Cleaver-Brooks Company, Dept. A, 394 E. Keefe Ave., Milwaukee 12, Wisconsin, U.S.A. Cable Address: CEEBEEWEST — all codes. Ask for catalog AD-137.

These typical exclusives mean more value per dollar



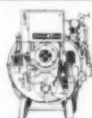
EASY MAINTENANCE — Hinged doors, front and rear, swing out of way when cleaning tubes.



EASY OPERATION — Controls on front head. Electronic combustion device standard equipment.



FOUR-PASS DESIGN AND FORCED DRAFT — Scrubs more heat from long gas travel. Combustion air in constant supply.



OIL, GAS OR COMBINATION OIL/GAS FIRING — 10-second fuel interchange. Full flexibility for greatest economy.



TWENTY-FIVE YEARS OF LEADERSHIP
BY THE ORIGINATORS OF THE SELF-CONTAINED BOILER



. . . for more details circle 188, page 14

ROADS AND STREETS, January, 1956

DIGEST of Current Technical Literature

By JOHN C. BLACK, Associate Editor

Shearing strength of concrete beams

Extensive tests and analytical investigations are reported in detail.

"The object of the investigation was to review and correlate the results of previous research in the field of shear and diagonal tension, to determine the modes and characteristics of shear failure of reinforced concrete beams, and to establish a general expression for the shear strength of reinforced concrete beams under different loading conditions. The investigation was limited to members subjected to combinations of shear and flexure only."

"A basically new empirical equation was derived for the shear strength of simple-span rectangular beams without web reinforcement and under one or two symmetrical concentrated loads. It is shown that the basic equation can be interpreted with the aid of the conventional theory of compression failures of reinforced concrete beams."

"The basic empirical equation was extended to include beams with web reinforcement, and the amount of web reinforcement required to prevent shear failure was determined. Furthermore, the same equation was modified to apply to simple span T-beams and restrained beams under symmetrical concentrated loads. It was found also that the basic equation could be used to determine the shear strength of a reinforced concrete beam under uniform load and, possibly, under any type of distributed loading."

Conclusion was reached that shear failures are actually a compression phenomenon. Shear-Compression failures differ from flexural compression failures only because the compressive area of the concrete is reduced by diagonal cracks which extend higher than the flexural tension cracks at failure.

Derivation of formulas is given in detail, accompanied by full tabular and diagrammatic data and numerous design sketches.

Major subdivisions of the 72-page report are — Simple-Span Rectangular Beams Without Web Reinforcement and Under One or Two Symmetrical Concentrated Loads.

Simple-Span Rectangular Beams

With Web Reinforcement and Under One or Two Symmetrical Concentrated Loads.

Simple-Span T-Beams Under One or Two Symmetrical Concentrated Loads.

Restrained Beams Under Symmetrical Concentrated Loads Beams Under Other Types of Loading.

The study was conducted by The Engineering Experiment Station, University of Illinois in cooperation with The Ohio River Division Laboratories, Corps of Engineers, United States Army, "Strength in Shear of Reinforced Concrete Beams" by Armas Laupa, Chester P. Siess, and Nathan M. Newmark, ENGINEERING EXPERIMENT STATION BULLETIN No. 428, The Engineering Experiment Station, University of Illinois, Urbana, Ill., 1955. (Price \$1.00)

"Retail gravitation" and traffic engineering

"Reilly's Law" of retail gravitation, first published in 1929, has proved useful in estimating the parking requirements of retail centers and the needed capacity of highways connecting such centers with residential areas. A recent refinement raises the precision and dependability of the calculations.

The conceptual principles of the theory appear to apply equally to many other phases of traffic engineering and city planning; and the method might very well provide a substitute which could be used at regular and short periods for the expensive origin and destination survey. The importance of further research is recognized.

In its original form, Reilly's law states "That two towns share the retail purchases of an intermediate place in direct proportion to the population of the towns and inversely with the squares of the distances between the towns and the intermediate place. This is formulated as

$$\frac{S_1}{S_2} = \left(\frac{P_1}{P_2} \right) \left(\frac{D_2}{D_1} \right)^2$$

where S_1 and S_2 are the sales made by the two towns to the residents of the intermediate place, P_1 and P_2 the population of the towns and D_1 and D_2 the distances from the towns to the intermediate place." Later work indicated that the exponent varies with the kind of merchandise and the size of the city.

"More recent developments in the use of the retail gravitation principle have adapted it for allocating to any number of 'towns' the purchases of any number of 'intermediate places.' By using this adaptation, the purchasing power of each of the residential areas (intermediate places) comprising the trading area of a city can be allocated with reasonable accuracy to each of the retail areas (towns) in the city.

"This adaptation states that the purchases of the residents of a neighborhood (usually a census tract or group of tracts) are attracted to the retail centers in direct proportion to the size of the centers (expressed in square feet of retail area) and inversely as the squares of the driving time-distances from the neighborhood to the retail centers. This is expressed in the formula at the foot of the page, where B_i is the buying power of neighborhood i ; $B_{i,a}$ the purchases made by the residents of neighborhood i in retail center A ; F_a , F_b , F_c , etc., the square feet of retail space in the retail centers A , B , C , etc.; $D_{i,a}$, $D_{i,b}$, $D_{i,c}$, etc., the driving time-distances between neighborhood i and the retail centers."

A hypothetical case is set up to illustrate the technique of estimating potential shopping goods sales at a planned center.

"The Law of Retail Gravitation Applied to Traffic Engineering" by Harry J. Casey, Jr., TRAFFIC QUARTERLY, July, 1955, published by the Eno Foundation, Saugatuck, Conn.

$$B_{i,a} = \left[\frac{F_a}{(D_{i,a})^2} + \frac{F_b}{(D_{i,b})^2} + \frac{F_c}{(D_{i,c})^2} + \frac{F_d}{(D_{i,d})^2} + \frac{F_e}{(D_{i,e})^2} \right] \times B_i$$

Alkali-aggregate reaction studies

Several methods not previously used in the study of alkali-aggregate reaction were applied in the studies described. Eleven diagrams and four photographic illustrations are included in the 22-page article. The bibliography carries 21 references.

Synopsis is as follows: "An interferometer procedure was used to determine the attack on characteristic active and nonreactive aggregates over an extended pH range, in solutions of NaOH, Ca (OH)₂, NaOH + Ca (OH)₂, and in aqueous extracts of high- and low-alkali cements. Curves are given showing the hygroscopicity of high- and low-alkali cement pastes and powders and the same cements with added reactive and nonreactive aggregates. Curves are given showing expansion of the mortar bars containing various percentages of Pyrex glass of different grain sizes. Microscopic studies of reactive aggregates in high-alkali cements are described, and photographs show instances where the major reaction takes place inside the opal grain rather than at the outside of the particle. This effect is rationalized in terms of the uneven distribution of the migratable ions. An expansion of 300 percent is demonstrated when opal reacts with soda to form a sodium silicate hydrate complex. It is believed that this expansion is the major cause of alkali-aggregate distress in concrete."

In conclusion, the authors state: "It is believed that the expansive forces responsible for the alkali-aggregate disintegration are initiated by the ion exchange reaction (or Donnan effect) between free water, migrating soda, and the reactive aggregate. This reaction brings together the components necessary for the formation of a hydrated sodium silicate complex of much greater volume than the original aggregate. Continued swelling may then be caused by the osmotic action of the cement paste and by imbibition of water by the hydrated sodium silicate complex."

"Mechanisms of Alkali-Aggregate Reaction," by Robert G. Pike, Physical Chemist, Concreting Materials Section, National Bureau of Standards; Donald Hubbard, Physical Chemist, Mineral Products Division, National Bureau of Standards; and Herbert Insley, Consultant, Washington, D. C., JOURNAL OF THE AMERICAN CONCRETE INSTITUTE, 18263 W. McNichols Road, Detroit 19, Mich., September, 1955. (Copies of this paper, Title No. 52-2, are available from the Institute at 50c each.)

Cableway speeded bridge construction in Canada

Cantilever erection of a 196-ft. 10-in. single track railway truss, Cooper's E-50 loading, in Northern Quebec involved an interesting application of cableway methods.

Two approximately equal spans were required to carry a branch of Canadian National Railways over the Bell River — one span, the westerly, over the swift and deep main stream, where cantilever construction was dictated — the other, or easterly span, across a shallow overflow area where falsework support was practical. Abutments and center pier were constructed during winter low waters.

Erection by cableway was determined by the fact that materials and equipment could be delivered by the railway to the westerly end of the crossing, but that to reach the easterly end, an expensive 20-mile winter haul by crawler tractor train over a contractor's tote road would be necessary and would be followed by a wait of several months for normal summer water level. This haul, it will be noted, would have involved all the timber falsework, three fourths of all bridge steel, and substantial amounts of heavy equipment.

Cable span was set at 600 ft. The head tower, located directly back of the west abutment, was 100 ft. high, with an opening at the base large enough for passage of a locomotive crane carrying bridge members.

The main cable was attached by a saddle to a trolley moving on the horizontal top member of the tower to bring the cable to any necessary location. Trolley operation was by hand winch from below. The cable was becketted off from the saddle on a single 18-in.-diam. sheave block. A single 14-in.-diam. wire rope was threaded through this sheave, with each segment carried to ground anchors on either side of the track at an angle wide enough to clear all equipment operated on the track.

The tower legs were pin-hinged at base to permit forward movement of the tower within the limit of the guys when the cable was heavily loaded.

The tail mast, located 40 ft. back of the east abutment, was needle point in type, 120 ft. high, and mounted on a swivel base. It, and its supporting guys were the only items carried over the tote road. It was divided into three parts for hauling. Three days were required for the trip.

To align the cable over the position of each truss member to be placed, the mast was tilted laterally by means of a luffing tackle, operated, like the head tower trolley, by hand winches. Guy

anchors limited the range of this movement.

The cableway was designed for a 6-ton hook load — the weight of the heaviest bridge member to be erected — a 2,600-lb. counterweighted falls block, the heavy track cable, friction of the operating mechanism and wind forces. Cable sag under the heaviest load was limited to 36 ft.

The completed easterly span served as counterweight for the east cantilever while across the river, the west cantilever was held by an anchorage weighted with rail steel.

To assure accurate closure at the cantilever junction, careful calculations were made of all deflection and deformations in truss members and anchor tie-backs. It was assumed that the spans had been fabricated at 60° F., and that closure would be made at 80°. "The procedure programmed in the office was to install all closure members early in the morning when the steelwork would be at a lower temperature than the temperature used in computing the end-bearing centers, bolt the connections at one end.

When the segments of the span increased in length as the temperature rose during the day, bolt the far end at the time the holes in the connections came into agreement. However, on the day previous to the date scheduled for this work, finding that the temperature of the steel was approximately 80°, certain of the closure members were placed in position and it was found that the holes in the end connections matched; consequently, the closure was completed without adopting the expedient described above.

Crews began erecting the tail mast, drilling holes for ground anchors, and placing a cable walkway on June 20; soft roadbed delayed work train operation and material delivery till July 5; cableway operation began on July 20; east span was in place with bolted connections, Aug. 3; and west span closure was made Aug. 25.

Rivetting of both spans, dismantlement of the cableway, and loading of all equipment, were completed September 21.

Erection procedure is described and numerous features pictured in this 7-page article.

"Cableway Replaces Travellers for Steel Erection on Bridge in Northern Quebec" by E. J. Napier, Regional Bridge Engineer, Canadian National Railways, ROADS AND ENGINEERING CONSTRUCTION, 341 Church St., Toronto 2, Canada, September, 1955 (Price 75c).



● Dozer and roller together do a lot of compacting per pass.

Shortcuts to Quicker Lower Cost Compaction

(From LeTourneau-Westinghouse
Company)

MODERN, rubber-tired, self-propelled earthmovers can help achieve compaction results quickly and at low cost. Here are some shortcuts toward helping meet compaction standards:

1. Spread "on the run." Best spreading results are obtained when travel is at speeds corresponding to the rate of material flow from the scraper.

Spread should be made within a distance of 65 to 100 ft. and be completed in 30 seconds or less. This insures uniformity.

2. Build up fill in thin, uniform layers 4 to 12 in. thick. The thinner the fill is laid down the easier it is to compact.

3. Blade the fill with a bulldozer or motor patrol. If neither of these

tools is available, a self-propelled scraper can do double duty. Drop the blade with apron closed on every third or fourth return trip and level the fill.

4. Before beginning the haul across the fill, be sure earth is moist enough to pack. Sprinkle if necessary.

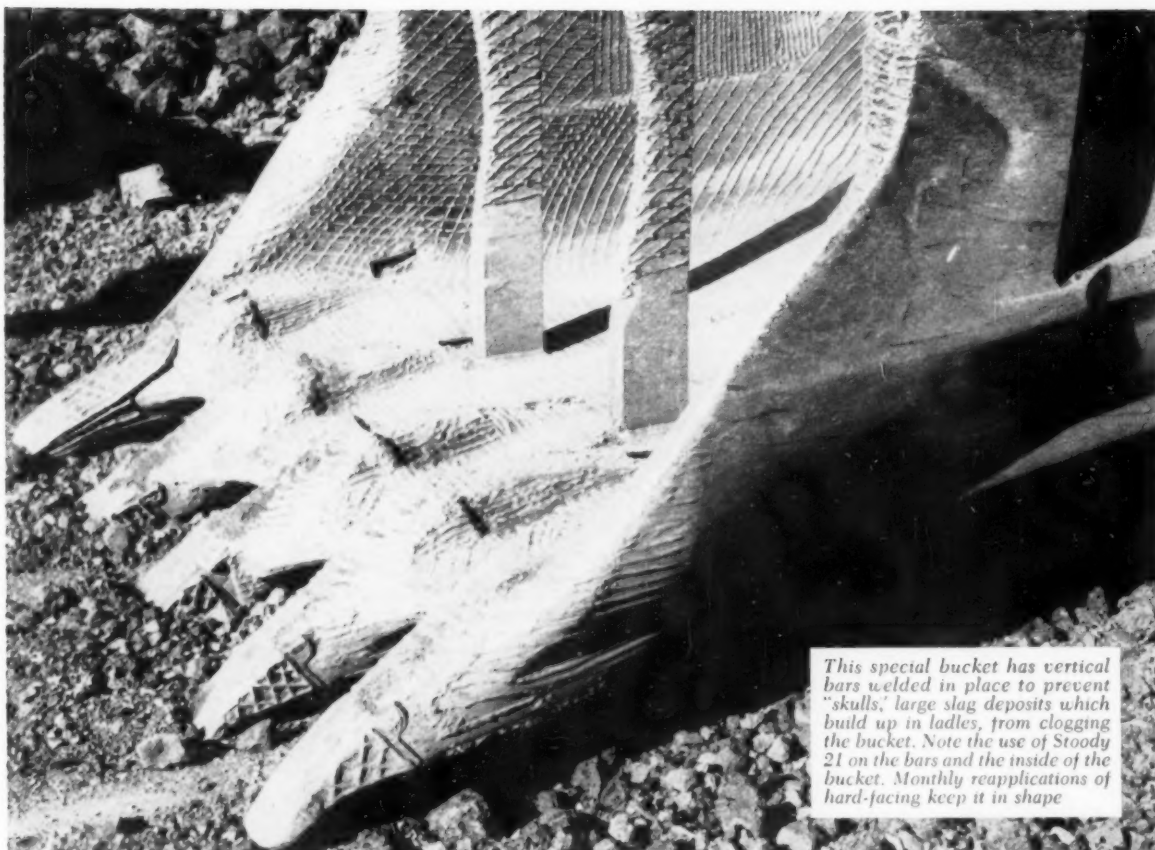
5. A sheepfoot roller seldom "walks" completely out of the foot depressions. It leaves the top 2 to 5 in. in a loose binder layer which is compacted at the bottom of the next lift. When the roller does "walk" out completely, loosen the surface with a disc harrow to maintain a good bond between lifts.

6. Carefully routing of self-propelled scrapers or rubber-tired tractors across fill aids and speeds up compaction. The rolling action of the broad, low-pressure tires tends to confine and compact the soil rather than displace it. In its normal travel across the fill, the big rubber tires of modern earthmoving equipment may provide as high as 80% to 85% of the specified compaction. This is especially important as the fill nears completion because rubber-tired machines will pack the top 2 or 3 inches that remain loose behind the sheepfoot roller.

Success or failure of roads, airports and other structures built of earth depends on the conditions of the fill. Proper compaction permits surfacing materials to be placed immediately and accurately. It insures the long life of an earthen structure. It helps make the fill water-tight and allows it to carry heavier loads. If properly tracked on the fill, man-high 2-ft. wide earthmover tires do an excellent job often comparable to standards of special compaction tools.



● How hauling equipment is routed is a factor in securing density.



This special bucket has vertical bars welded in place to prevent "skulls," large slag deposits which build up in ladles, from clogging the bucket. Note the use of Stooddy 21 on the bars and the inside of the bucket. Monthly reapplications of hard-facing keep it in shape

GETTING BETTER SERVICE FROM ALL TYPES OF BUCKETS

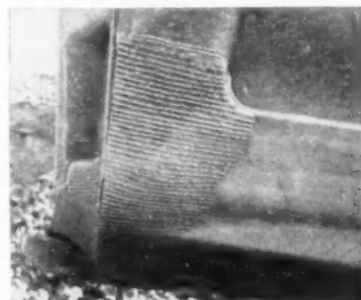
Down in Birmingham, Alabama, there is a company that really knows all about buckets—the Birmingham Slag Company. This organization is chiefly concerned with the reclamation of blast furnace slag which is crushed and treated for the production of an aggregate used primarily for road building. There are few materials more abrasive than this slag; ordinary buckets just can't take it without the protection afforded by extremely wear resistant hard-facing. This is true of all types of buckets used by Birmingham Slag Company... *special shovel buckets handling the "skulls," clam shells and scoop lifts.*

The pictures here pretty well tell the story. The company uses Stooddy 21 liberally as shown in the illustrations to protect teeth, lips, sides and runners. As wear occurs, reapplications of Stooddy 21 are made, as necessary, to keep the equipment in top operating condition.

Get complete details on the use of Stooddy 21 and other Stooddy alloys; you'll find them in the Stooddy Guide-book, available from your dealer (consult the yellow pages of your telephone book)—or write to the company.



This latch plate also gets a Stooddy 21 treatment to prevent wear.



These Stooddy 21 beads across the bucket here resist severe abrasion as it is dragged across the rubble in the slag pit.



The lips on this clam shell are kept in good shape with beads of Stooddy 21 for a tight seal.



The scoop lifts handling crushed aggregate lead a rough life; Stooddy 21 keeps the lips, sides and bottom in condition. Occasional beads of this material are added as wear occurs

STOODDY COMPANY 11925 E. Slauson Ave., Whittier, Calif.
... for more details circle 246, page 14

ROADS AND STREETS, January, 1956

New Publications

Data on modern methods for removing ice

Engineers will agree that snow can be removed by methods known to every engineer, but the removal of ice is a different problem. There are so many variables involved in ice control in winter maintenance work it is difficult to set a pattern or procedure for removing ice under all conditions.

However, certain information is available on methods which have been used effectively. One method includes the use of straight chemicals or mixtures of chemicals.

Treated abrasives are regarded as the backbone of winter maintenance work, and they will provide immediate traction for motorists who must travel icy pavements. But where ice must be melted in a short time, other methods often must be employed. For engineers who face such problems, the Information Circular on the subject "Ice Control" will be of interest. Free copy available from the Calcium Chloride Institute, 909 Ring Bldg., Washington 6, D.C.

CRACK ARRESTING BY OVERLAYS OF NOTCH-TOUGH WELD METAL. Naval Research Laboratory. Sept. 1955. 9 pages, illustrated. (Order PB 111781 from OTS, U. S. Department of Commerce, Washington 25, price 50 cents.) Crack-starter explosion tests were made to demonstrate the feasibility of using overlays of notch-tough welds to prevent brittle fracture in structural mild steels. Investigation leads to the recommendation that notch-tough weld deposits be considered for the protection of welded structure by application at points where brittle fractures are known to initiate. This method is considered practical for application to existing or new structures.

EFFECT OF TEMPERATURE ON THE DUCTILITY OF HIGH-STRENGTH STRUCTURAL STEELS LOADED IN THE PRESENCE OF SHARP CRACKS. Naval Research Laboratory. June 1955. 29 pages, illustrated. (Order PB 111720 from OTS, U. S. Department of Commerce, Washington 25, Price \$1.00.) The brittle fracture of wartime merchant ships and other large welded structures has resulted in extensive investigations of the factors contributing to such failures. This is a report of research on the effect of temperature on the fracture characteristics of various high-strength structural steels when loaded in the presence of a sharp, crack-like notch as determined by the NRL Drop-Weight and explosion Crack-Starter Tests. The concept of critical fracture transition temperatures is ad-

vanced to define the changes of steels with respect to absolute temperature levels of the transition interval. A discussion is presented relative to the use of the critical transition temperature concept in design.

SOIL AND SOIL-AGGREGATE STABILIZATION; Bulletin 108, The Highway Research Board, 2101 Constitution Ave., Washington, D. C. This 175-page bulletin priced at \$3.00 is a symposium of articles on the subject presented at the 34th annual meeting of the Board, January 11-14, 1955. Dedicated to C. A. Hogentogler, pioneer in experimental work in soils and road materials, the volume represents an appraisal of our present state of knowledge on the subject.

The first papers describe soil as a natural body having distinct characteristics inherited from the materials from which it is derived and the environment which produced it and, discuss the fundamental nature of soil as it has been drawn from the several different branches of science. The main body of papers describe our present knowledge of the art and science of stabilization of soils, whether by control of grain-size distribution and characteristics of the soil itself or by the addition of organic or inorganic compounds to artificially produce or to maintain a stable condition.

1955 BOOK OF ASTM STANDARDS: Part 1 — Ferrous Metals, 1834 pages, 6x9.

The American Society for Testing Materials new "Part 1 — Ferrous Metals," is 11 percent larger than the 1952 edition; and it contains 125 standards new or revised since the 1954 Supplement. Since 1952, 211 standards are new or have been revised.

Part 1 contains standard and tentative specifications, methods of test, and definitions for steel piping materials; flat products; bars, bolts, and rivets; billets, forgings, and axles; rails and accessories; railroad wheels; springs; concrete reinforcement; corrosion-resisting steel; metallic coatings for steels; welding rods; wrought iron; cast iron; malleable iron; magnetic materials; ferro alloys; and metal powders; as well as general methods of testing. It is especially important in the heavy machinery, railroad, and construction industries. Materials engineers, purchasing agents and others

concerned will need the new Part 1 to enable them to be sure of using the latest applicable standards.

The remaining parts of the 1955 Book of ASTM Standards are in preparation.

The book is an example of the results which come from the Society's technical committees, bringing together the viewpoints of producer, consumer, and the representatives of general interest in developing competent, unbiased and widely-applicable standards for the manufacture, purchase, delivery, and acceptance of materials.

Part 1 is available from ASTM Headquarters, 1916 Race Street, Philadelphia 3, Pa., at \$13.50 per copy. The complete seven-part Standards is \$84.00.

CALCIUM CHLORIDE FOR WINTER MAINTENANCE. The value of treated abrasives in providing traction for motorists on slippery roadways during winter months has been recognized for many years by highway department officials.

Most engineers realize that moist abrasives have the ability to stick to the roadway better than untreated abrasives. And they rely on calcium chloride to provide moist abrasives, freezeproofed and workable even in coldest weather.

The new bulletin, "Calcium Chloride for Winter Maintenance," explains the advantages of using calcium chloride when treating abrasives, lists the types of abrasives normally used in winter maintenance work, and describes procedures for stockpiling abrasives for winter maintenance operations.

A free copy of the new bulletin may be obtained by requesting Brief IB-1 from the Calcium Chloride Institute, 909 Ring Bldg., Washington 6, D. C.

BIBLIOGRAPHY ON PRESTRESSED CONCRETE, 1955 edition, has been published by the American Concrete Institute. Expanded to 103 pages, the book now lists more than 2100 American and foreign literature references on the subject of prestressed concrete, published from 1896 into 1955. A separate section lists 75 United States, British, German, and French patents. The 8½x11-in. format is also punched for easy filing in three-ring binders. Its price is \$2.00.

A supplement, containing the material added to this new edition is available at 35 cents to those who purchased the 1954 edition.

The book was prepared as a part of the work of ACI-ASCE Committee 323, Prestressed Reinforced Concrete.

B.F. Goodrich



How All-Purpose tires save 25% on tire costs for concrete company

HAMILTON CONCRETE PRODUCTS, INC. manufactures and delivers all types of concrete block and cast stone in Chattanooga, Tenn. Delivery trucks work 10 hours a day, 6 days a week, must travel over rocky, rutted construction roads. Tires could be quickly chewed to pieces, skyrocketing costs.

But not at Hamilton. This company uses B. F. Goodrich All-Purpose tires, reports they give 15% more mileage

than other makes. And because these tires can be recapped, the company saves 25% on tire costs.

B. F. Goodrich builds the All-Purpose with a tread that's up to 67% deeper than that of a regular tire. This extra, tough rubber defies rock cuts. Curved cleats give positive pulling power in forward or reverse. And in sizes 8.25 and larger 2 extra breakers guard against shocks and bruises.

For really rugged jobs, choose *all-*

nylon All-Purpose tires. Nylon withstands double the impact of ordinary cord materials, resists heat blowouts and flex breaks. This B. F. Goodrich tire body outwears even its extra-thick tread, *can be recapped over and over!*

Why not see your B. F. Goodrich retailer today and find out how BFG off-the-road tires can reduce your costs. Tires are available in *all-nylon* or rayon construction (both types with nylon shock shield which gives more recaps). The B. F. Goodrich Company, Tire & Equipment Division, Akron 18, Ohio.

Specify B. F. Goodrich tires when ordering new equipment



AURORA REDI-MIX Concrete Co., N. Aurora, Ill., has tried other tires, but has standardized on BFG tires because they cut costs per mile.

... for more details circle 201, page 14



ALL-PURPOSE TIRES give more original mileage, more recap mileage, for N. E. Finch Co., crushed rock hauler of East Peoria, Illinois.



Your B. F. Goodrich retailer is listed under *Tires* in the Yellow Pages of your phone book



● Students on the way to classes at the National School of Heavy Equipment Operations.



● Founder of unique school, Gilbert S. Shaw, who got the idea from a truck driving school.

Unique School for Operators

THIS college's 71-acre campus gets ripped up every day. That's what the students are there for. Yes, there is such a school, the National School of Heavy Equipment Operations, located near Charlotte, N.C. Among its students are two brothers, Clyde and Ivey Hull of Morgantown, N.C., who recently spent four weeks learning how to rip up virgin land. And when they had completed the course, they received a diploma for doing it.

The school, started in March of 1955, is said to be the only one of its kind in the world. Instead of textbooks this school furnished the two brothers with brand-new track-type and wheel tractors, scrapers, motor graders, and shovels, and showed them how to build new roads, knock down trees, bulldoze, dig ditches, build dams, plus other phases of the earthmoving industry.

Clyde, a 27-year old former insurance salesman, and Ivey, a 25-year old ex-GI, learned about the school from a want-ad section of a local newspaper. Neither one could tell a tractor from a motor grader, but they wanted to get into the earthmoving industry, so they enrolled in one of the three available courses. Each paid \$250 tuition fees with \$11 more per week for room and board. They ate exceptionally well and lived in quiet, clean, and comfortable quarters at the school site. Although both are married and have families, they soon hope to be employed by a contractor working overseas. The higher wage scale usually found on out-of-the-

country jobs is the big attraction for the two boys.

Both soon learned that mastering the difficult skill of earthmoving was no snap. Handling today's big rigs is not child's play, but an art that relatively few master in a few short weeks. The concentrated course required a total of 218 hours. Almost two-thirds of this total was spent in the field, operating and observing the equipment. The balance was spent in classrooms, learning the theory of proper operation and maintenance.

Gilbert S. Shaw, who founded the school, declares that 90% of the graduates have been hired by contractors. Shaw, quiet-spoken, far-sighted, and a stickler for high morals in his school, admits he started the institution more on faith than money. With more than a quarter of a million dollars invested

in equipment and land, most of it has been supplied by a leading southern equipment dealer, A. E. Finlay & Associates, of Charlotte, several equipment manufacturers, and a group of civic and religious men.

Shaw is so pleased with the school's success, he now plans to open up an additional school, probably on the west coast. With only nine enrolled in the first class, the school has already turned out 130 students, and is booked to solid capacity of 35 students for each semester through February, 1956.

New York Thruway Open Almost into NYC

The 427-mile thruway linking New York City and Buffalo became a continuously open route in December with the opening of the 6-lane bridge over the Hudson River.

Dedication ceremonies commemorating completion of this bridge and the 28-mile section of road immediately north of New York City, were attended by Governor Harriman and other dignitaries.

The cost of the system's "main line" from New York City to Buffalo, includes \$580 million for the highway and bridge. Another \$400 million is to be spent for 136 miles of spurs.

The Hudson Bridge between Terrytown and South Nyack, costing \$60 million, and involving unique semi-floating cellular foundations, will carry an expected 20,000 vehicles per day during 1956.



Instructors show Clyde and Ivey, along with other students, how to lay out grade stakes.

Highway Leaders Look to Washington

Need for early legislation for an expanded Federal highway program dominated the AASHO convention. Significant forward thinking by the technical committees was also revealed at New Orleans.

WHEN Congress finally acts on an enlarged highway program, the nation's highway engineers through their highly developed state departments and technical committees will be ready to do the job.

This is one of the impressions which visiting Congressmen took back to Washington, following their appearance on the program of the 41st annual meeting of the American Association of State Highway Officials. The meeting held in New Orleans December 6-9 spotlighted the need for Congress to act speedily on the proposed enlarged federal highway program, so that state legislatures and road planners can quit marking time while highway deficiencies continue to pile up and congestion and accidents to mount.

●*Keynoting* the convention was the statement by retiring president George T. McCoy, state highway engineer of California, who noted that "the year 1955 saw more constructive talk and less constructive action than any comparable period in modern highway history." In a nation where congestion and hazards are already intolerable, he observed that "with another 20 million vehicles due on the roads in the next ten years, it is clear that to stand still now in highway modernization is to fall further backward."

President McCoy urged that new highways, particularly new interstate construction, be designed for needs 30 years ahead to insure adequacy for an expanding national economy and population. Only 8% of the nation's key roads are presently built to adequate standards, he said. "The magnificent dream of a network of super-highways is, for all practical purposes, still just a dream."

Access control on main highways to insure against roadside encroachment and early obsolescence was urged by McCoy and other speakers at the various sessions, as a basic element in planning and design. "Modern controlled-access highways are their own

best salesman," said McCoy. "Successful facilities in operation instill public desire to extend road modernization at all government levels and on all road systems." While warning against extravagance in planning, he noted that there is far less danger of setting design sights too high than of failing to keep pace with motor vehicle technological advance and of failing to gauge accurately the traffic trends and needs of the future. Public funds could be wasted in building nothing but a "network of contemporary obsolescence."

●*Federal Legislation.* Senator Albert Gore (D-Tenn.), chairman, Senate subcommittee on public works, said that in any forthcoming legislation, Congress should not undertake to dictate highway location, but that "it must decide the basic policy, scope of the legislation, how far to go, and how fast on an over-all basis." Senator Gore who was author of a Senate road bill in 1955 criticized the Administration's plan which "slighted primary, secondary and urban problems at the expense of the Interstate System."

"Though there is disagreement on

financing methods," said Senator Gore, "and on the apportionment formula and how funds should be divided between segments of the economy, I am confident that early next year a comprehensive highway program will be enacted into law."

Also agreeing on the need for a larger road program but concerned with its financing was Representative Clifford Davis (D-Tenn.). Representative Davis, a member of the House committee on public works, represented Charles A. Buckley (D-N.Y.), chairman, House committee on public works, and George H. Fallon (D-Md.), chairman, House subcommittee on roads. He said that "the whole country and all interests involved must take a realistic view, come back afresh, and get this bill out of the way as soon as possible. The people of this country are willing to pay reasonable costs at all levels for safer, improved highways, justified on sound reasons of economy, safety and efficiency."

Senator Edward Martin (R-Pa.), ranking minority party member and former chairman, Senate committee on public works, further revealed the tenor of thinking in Washington, saying "There is no doubt in my mind that the financing problem related to highway development can be solved in a way that will distribute the cost on a fair and equitable basis."

Such a solution will not be diffi-



● A. E. Johnson, executive secretary of AASHO, at New Orleans in conference with George S. Covert (standing), Louisiana director of highways and retiring AASHO president George T. McCoy, of California.

cult, said Senator Martin, if all parties concerned approach the problem in the American way. That means placing national interest above sectional advantage. It will require strong and resolute resistance to those groups who seek to exert political or other pressure in their desire to gain selfish advantage."

Again affirming the intent of Washington leaders to do something about roads in 1956, the fourth such speaker, Myron V. George (R-Kan.), member of the House committee on public works, said "In my opinion it will be the duty of every elected or appointed official to see that we construct immediately an adequate highway system, so that this important element of our economy may not be stagnated by lack of proper legislation and financing. During the coming season, Congress must resolve its differences."

● **Bureau Policies.** The AASHO's high sense of responsibility was noted by

C. D. Curtiss, Commissioner of Public Roads, who outlined important aspects of the roadbuilding job ahead. Right-of-way is a first consideration, he reminded, and our greatest source of difficulty. Too often, engineers have been forced to design for inadequate widths. Emphasizing that the Bureau will avoid a policy of rigid width requirements, he urged acceptance of such guide values as 200 ft. in urban and 300 ft. in rural areas for Interstate system projects. Right-of-way will cost \$8.2 billion or 23% of all urban projects in the 10-year federal program recently considered.

New concepts of access control and highway safety were also called for by Commissioner Curtiss, and research in highway law as currently undertaken by the Highway Research Board.

● **Manpower.** A broad new attack on the manpower problem in highway work was outlined by A. G. Clark, deputy commissioner for engineering, Bureau of Public Roads. Commission-

er Clark's paper detailed the progress already made, and the yet untouched possibilities, in the use of electronic computers, two-way radiotelephone, electrical subsurface exploration, aerial engineering photogrammetry.

As an example, he estimated that 90 to 100 man-hours of personnel work per mile are required to plot field notes, check figures, ink drawings, do templating, planimetry and computing of earthwork volumes. In contrast, the work can be done in 3 man-hours by full use of electronic computers, cutting the cost from \$200 down to \$20 per mile for salary and equipment rental. Such means of better utilizing engineering and technical personnel will help do the job ahead more efficiently and will make the highway field more attractive to new people. Test projects for all-out use of new techniques is to be encouraged by the Bureau.

Following are briefs from a selection of papers and discussions, selected somewhat at random from committee sessions. These covered administration, bridges and structures, construction, materials, uniform accounting, factual surveys, maintenance and equipment, right-of-way, design, public relations, traffic, roadside development, radio and legal affairs.

● **Maintenance.** In a review of contract maintenance, C. W. McCaughey (Ohio), chairman of an AASHO subcommittee on the subject, noted the need for clarifying definition of the terms "maintenance," "betterment" and "contract maintenance." The latter he feels should include production of necessary materials, supplying equipment under rental agreements, and furnishing essential services.

The number of different items of work now performed by contract in various states has increased to 70, according to a recent questionnaire. Standardization of terms should be accompanied by a study of means of improving the over-all efficiency and lowering unit costs of providing traffic service. Closer cooperation between contractors, contractor associations and state maintenance engineers is needed, so that all concerned can determine where contract work fits best.

Contract vs. departmental maintenance was also reviewed by G. F. Hellesoe (California), who analyzed the complexities of proper maintenance today. He said that in evaluating the efficiency of the dollar spent, by whatever means, the method must be selected with full consideration of its effect on traffic and highway-plant needs. "It accomplishes little," he observed, "if to secure a lower unit cost

Pioneering New Concepts in Intercity Expressway Maintenance and Operations

Two turnpike leaders gave a timely new perspective on the transition of thinking required for operating expressway-type facilities. Charles M. Noble, chief engineer, New Jersey Turnpike, in addressing the maintenance committee session, outlined the sharp differences between maintaining lightly traveled local roads and heavily traveled high-speed highways. The difference stems from a different driver attitude. Drivers on an expressway are highly intolerant of maintenance work or policing that hampers his driving in any way.

More intensively planned and supervised maintenance of roadbed, roadside and traffic operation is a requirement of an intercity expressway, such that entirely new concepts of the job are necessary. The 258 motorized machines required for the 118-mile New Jersey Turnpike represent but one part of the task for this organization. The machines themselves and the methods of using them are adapted to safe operation, with considerable equipment specially designed or modified for turnpike conditions. Signing of machines and approach lanes for all repair work is of

major importance. Studies of driver behavior patterns show that sleepy drivers, lack of alertness and other human failings cannot be entirely eliminated, with the result that flagmen must take special precautions not heretofore considered necessary to safeguard themselves, the highway workers and the public.

Where contract maintenance is performed, the contractor on the Jersey pike is given instructions and specifications covering flagging and other conduct of the work which represent pioneering in explicitness.

B. D. Tallamy, chairman, New York State Thruway Authority, reinforced Noble's talk by an illuminating account of the problems of maintaining roadbed and traffic flow, preventing accidents, handling emergencies and catering to Thruway patrons. Motorized units totaling 578 are in use on this 400-mile-plus superhighway, now in its second winter of cross-state operation. Here, too, pioneering of new techniques is the order of the day. (ROADS AND STREETS will present a detailed summary of the methods and experiences in an early issue).

Gen. Merrill Succeeded by Rex Whitton

A dramatic turn of events following the New Orleans convention of the AASHO was the sudden passing of Maj. Gen. Frank D. Merrill. The New Hampshire Highway Commissioner had just been made President of the AASHO and was enroute back home.

In accordance with the AASHO constitution, Rex Whitton, chief engineer, Missouri state highway department, automatically advanced from first vice-president-elect to the presidency of the Association.

Gen. Merrill, who won fame for his leadership of Merrill's Marauders, an all-volunteer unit of battalions which spearheaded the Chinese-American attack on Northern Burma in 1944, had shown leadership qualities in highway affairs, including direction of his state's road progress and of the New Hampshire turnpike construction.

Rex Whitton, a veteran of 32 years with his department, first came into national prominence as maintenance engineer of the Missouri department. He has been chief engineer since 1951.

Vice-Presidents: New v-p's for 1956 are John W. Johnson, superintendent of public works, New York; C. R. McMillan, chief highway commissioner, S. Carolina; L. N. Ress, state engineer, Nebraska; and Mark Watrous, chief engineer, Colorado.

Executive Committee: Newly elected, M. J. Hoffman (Minn.); Russell H. McCain (Md.); John A. Volpe (Mass.); C. D. Curtiss (BPR); R. R. Bartelsmeyer (Ill.); George S. Covert (La.). Carried over, D. C. Greer (Texas), J. A. Anderson (Va.), R. H. Baldock (Ore.).

Treasurer: E. W. Kilpatrick, New Jersey.

Executive Secretary: A. E. Johnson, Washington, D. C.



Rex M. Whitton

AASHO Policy Statement on Federal Legislation

- The AASHO urges the Congress to enact an expanded and adequate highway program early during the Second Session of the 84th Congress, and to make funds authorized thereunder available for state apportionment by July, 1956.
- Further delay in taking action will cause additional critical traffic congestion and accidents, as well as create indecision at all levels of government in highway planning and construction and thereby materially retard the economy of the United States.
- Any Federal-aid program authorized should be administered by the Bureau of Public Roads and constructed by the state highway department — the working relationship so successful over past year.
- An enlarged program should indicate intent to construct the 40,000 mile Interstate System in not more than 15 years and to provide a progressive increase in the Federal-aid to the Secondary, Urban, and Primary Systems. Initial authorization for a period of 5 years.
- Matching of construction funds for the Interstate System should be on a 90% Federal, 10% State basis; on the other systems as provided under existing legislation.
- A 20% transfer provision should be allowed between Secondary, Urban, and Primary allocations to make the highway program flexible enough to meet the most pressing needs of the individual States.
- Funds for the Interstate System should be initially apportioned on a basis of need as indicated by the Section 13 Study as reported by the Bureau of Public Roads, and as indicated by future successive needs estimates; estimates to be made first in 1957 and in 5-year intervals thereafter. Apportionment to the other systems should be on the present basis.
- The subjects of reimbursing for the moving of utilities from public highway rights of way, of labor relations and requirements, and of vehicle sizes and weights should not be included in Federal statute but should be matters to be determined at the State level.
- Congress is asked to consider dedication of more of the general fund to road construction, in view of the Federal responsibility in the National Defense system of highways.
- Such additional revenues as may be needed in the judgment of Congress for financing could be obtained by one or more of the following possibilities: (a) A reasonable increase in the present Federal Motor Fuel Tax; (b) A reasonable tax or an increase in tax on items not now taxed by the States, but that will serve as a measure of highway use; (c) The reasonable use of short-term credit financing with due consideration to its affect upon the National debt limitation.

the plant is subjected to greater damage and traffic to loss by added hazards or delays. The open, unrestricted highway must be the objective.

●**Maintenance Classification.** Also seeking new definitions to aid in classifying, accounting and the exchange of ideas, Joseph Barnett, Deputy Assistant Commissioner of Public Roads, urged separation of work into four classifications: new construction, betterment, physical maintenance, and maintenance of traffic services. Snow removal, renewal of signs and markers, etc., do not restore the highway proper but are part of services to the "customer." There should be a separate accounting of such work, he said. Barnett's proposal is to charge all of a resurfacing job to capital betterment where the surface increment is greater than $\frac{3}{4}$ in., rather than split hairs

and try to allocate the part involving restoration of original thickness to maintenance, the rest to betterment.

Most states charge maintenance shop buildings to the capital account, observed Barnett, but shift the cost gradually back to maintenance where it belongs, by bookkeeping charges against equipment repairs as incurred.

Barnett, who is secretary of AASHO's committee on planning and design policy, spoke before the maintenance committee under a purpose of cross-fusion of ideas which he praised as a forward step in highway work. Right-of-way men, for example, are getting together with design men more often today, and maintenance men with administrators, designers and construction staff, as a means of reviewing mutual problems and arriving at ideas for the common good.

Kentucky contractors get 40 days extension

Late this autumn, contractors engaged in Kentucky highway projects were given another 10-day extension, following a 30-day extension previously granted because of bad weather.

This move was made by M. W. Tinder, Commissioner of Highways, in recognition of delays suffered by contractors because of wet weather during the months of April, May, June and July. According to the order, data collected by the Highway Department's field engineers, the Kentucky Turnpike Engineers and information furnished by the Kentucky Association of Highway Contractors furnished the basis for the decision to extend the time for completion of contracts.

The newest official order extends for 40 days the time on all contracts on which the effective date of the work order was April 1, 1955, or before, provided these contracts were active through July 31, 1955. In the event the effective date of the work order was after April 1, or if the contract was completed prior to August 1, then the extension of time is given as the proportional part of 40 days based on the ratio of 40 to 122.

The official order pointed out that during that period covered, it was found that 60 days of bad weather had interfered with progress of work, but department officials figured that 20 days of inclement weather could be accounted as normal.

Contractors form new promotional group

At a meeting in Chicago, a new permanent national organization to be known as National Resources Development, Inc., has been formed. It is composed of contractor executives and

its purpose will be (1) promoting the improvement of the national highway system and (2) advocating a continuing program of federal public works of a broad national and regional character that has economic value. Peter Kiewit, of Peter Kiewit Sons' Company, Omaha, Nebr., is to be chairman of the committee until the permanent organization is effected.

Contractor leaders attending the conference numbered the following: George H. Atkinson, Guy F. Atkinson Co., of San Francisco, Calif.; W. B. Curtis, Morrison-Knudsen Co., Boise, Idaho; George C. Looz, Stolte, Inc., of Oakland, Calif.; H. B. Zachry, H. B. Zachry Co., San Antonio, Texas; Max C. Harrison, Harrison Construction Co., Pittsburgh, Pa.; D. W. Winkelman, D. W. Winkelman Co., Syracuse, N.Y.; F. M. Groves, S. J. Groves & Sons Co., Minneapolis, Minn.; E. H. Honnen, The McCoy Company, Denver, Colo.; George Drake, and R. P. Bayard, Johnson, Drake & Piper, Inc., New York City; Fred Birch, S. Birch & Sons Construction Co., Great Falls, Montana; and John Macleod, Macco Corp., Paramount, Calif.

Improving river gravel by adding crushed stone

By Conrad M. Kelley. 29th Annual Highway Short Course, Texas Highways. Highway Research Abstracts, September, 1955.

In the Dallas District, there is an abundance of gravel along the Trinity River. This gravel, for the most part, came from the disintegrated and broken fragments of hard limestone and sandy formations to the west of Dallas County.

The material has been used for many years with varying degrees of success as flexible base material. This paper was prepared to report some of the problems encountered in the

use of river gravel as a base material and to present some of the efforts of this district to satisfactorily use this material in present-day load designs.

During the 1930's efforts were made to use the river gravel by exercising control of gradation, soil constants, and density. There was an improvement in the use of this material, but the constantly increasing loads proved that it still could not withstand a heavy load when used as the top section of flexible base under thin surfacing.

The river gravel was tested triaxially, and an average value of class 3.7 was established as the strength. Hence approximately 11 inches of superior material is required above this gravel to satisfy long-life road-design requirements. This led to efforts to improve the quality of the gravel by admixtures.

The four most successful admixtures are: (1) river gravel with admixture of limestone screenings from stockpiles of commercial screenings left over from production of crushed stone; (2) river gravel admixed with terrace or hillside gravel, a calcareous clay gravel containing a considerable amount of broken fragments of Austin chalk; (3) river gravel blended with the excellent Tehuacana limestone rock from the eastern section of Kaufman County; and (4) river gravel blended with hillside clay and Tehuacana limestone rock.

The paper contains laboratory tests performed on the four blends described. The initial laboratory success of adding crushed stone to river gravel encourages further research and justifies more trials under field conditions.

• Damage to bridges and roads is estimated at \$70 million from the 1955 floods in Connecticut, New York, Massachusetts, New Jersey and Pennsylvania. This is a part of the grand total of \$400 million in property damage estimated.

• Four-lane-divided, controlled-access highways in North Carolina are 34% safer than highways in the state having no access control, according to recent accident statistics. This percentage refers to number of accidents.

Is this oldest tractor?

Pictured here is a snapshot sent us by a **ROADS AND STREETS** reader, J. R. Paterson, excavating and hauling contractor of Kapuskasing, Ontario.

He describes this as a Caterpillar 15 tractor, approximately 1927 model, with homemade overhead loader. This machine is still working and turning out about 75 cu. yd. of sand excavation per hour.



• 19 year old Caterpillar tractor with special loader still used by Ontario contractor.

Airport Subbase Built From

Old Railroad Embankment



● Loading borrow material at the railroad embankment. Allis-Chalmers 360 scraper, part of team which delivered 3,500 cu. yd. per day on 2-mile round trip haul.

SCRAPERS on a two-mile round-trip, instead of the usual importation by truck, placed runway subbase material for Chicago's new O'Hare Field.

The job initially called for obtaining 75,000 cu. yd. of suitable material from a 2-mile strip of an old railroad embankment that intersected the runway site. Contractors bid the job on this basis, the low bidder being Rock Road Construction Co. of Chicago.

As a precaution against finding insufficient acceptable material from the embankment, it was originally specified that the remaining 25,000 cu. yd. of granular material required be brought in from off the base. Various bids ranged from \$1.85 to \$5.50 a yard for this material.

As it turned out, the amount of ballast and other granular material that had worked its way into the old rail fill was so large that the remaining 25,000 cu. yd. was readily taken from this source. The contract price was adjusted to account for this considerable saving in haul.

Rock Road started the job in May, 1955, by stripping 200,000 cu. yd. of topsoil. Earthmoving was mainly

scraper work. Three Euclids, three International Payscrapers, five W LeTourneau's, one B LeTourneau and an Allis-Chalmers 360, all with 15-18 yd. capacities, stockpiled soil near the site. For the leveling work the shorter hauls were generally handled by the five W's which were drawn and push-loaded by two International TD-24's and a Cat D8 tractor. Each rig moved about 1,200 cu. yd. per day on haul cycles averaging 4,000 ft.

● Taking material out of the old railroad embankment — International 20-yd. Payscrapers being push-loaded with a TD24 tractor.



Over 100,000 cubic yards of granular material obtained from this short-haul source in constructing new runway.

The subsoil here was a challenge to the scrapers. Most of it was a tough yellow clay. Several pockets containing about 70,000 cu. yd. of decayed organic matter had to be undercut and backfilled.

Getting the granular subbase material from the rail embankment involved some difficulties. Haul cycles were long — over 10,000 ft. on the average. Haul roads were in soft sand and the embankment was as high as 25 ft. Despite these drawbacks, the eight self-propelled scrapers averaged 15 minutes each for the round-trip, and collectively placed 3,500 cu. yd. per day of the subbase material on the runway area. Two International TD-24 tractors pushloaded on the old embankment.



● Jackson Vibro-tamper with Ford engine, compacting subbase. Also on the subbase hauling was this B Tournapull,

The method of cutting down the embankment was to work over a 200-ft. section at a time. Because of the sliding characteristics of sand, care was taken as the scrapers loaded up, to keep the working area as even as possible so that the pans would always have material to bite into.

Three Caterpillar 12 motor graders and an Adams 660 spread the material in 6-in. lifts. Two International vibro-tampers worked the fines into the coarse aggregate with two passes per lift. Final compaction was performed

by a 10-ton Buffalo-Springfield roller with 3 to 4 passes. Density specified was 95%, by the modified AASHTO method of test.

Specifications for the granular materials were as follows:

Size	Percent Passing
3 in.	100
No. 10	70
No. 40 sieve	25-70
No. 200	0-15

The runway, a flexible pavement of a 100,000 lb. ultimate wheel load de-

sign after future 2" overlay, consists of 10-in granular subbase, 8-in. water-bound macadam base, 1½-in. binder and a 1½ in. surface course. Included are five taxiway bleed-offs, a 100x400 ft. and a 100x4,000 ft. taxiway. Cost of the job, which was completed November 14, 1955, was \$1,319,000. Ralph H. Burke, consulting engineer, designed and supervised the project for the city of Chicago. F. D. Bellamy, district airport engineer, represented the Civil aeronautics Administration.

Unique Willow Mattress to Protect Pier Construction

To prevent scour of the Mississippi River bottom at a pier site for the new \$65-million bridge at New Orleans, a 3½-acre mattress has been sunk by the contractor, Dravo Corporation, Pittsburgh. As here pictured it is woven of willow trees cut from the bank, the 500-by-300-ft. mattress was ballasted with rock so it would sink. The 500-ton floating steel caisson that forms the base of the pier will knife through the center of the mattress on its descent into the river bed to a depth of 180 ft. below water. Without the

mattress, it was feared that the swift river current would wash away silt and mud from around the pier.

The 500-ton floating caisson was to be moored by a U-shaped steel structure. The caisson will form the base of one of the main piers. The stall, prefabricated at Dravo plant in Pittsburgh, will be held in position 550 ft. out from the riverbank by 39 steel pipe piles, each 3-ft. in diameter and 150 ft. long. The piles will be driven 60 ft. into the bottom and filled with sand and gravel to keep them stable.

Built by the Mississippi River Bridge Authority, the new bridge will have the longest cantilever span of any highway bridge in the world.

● Floating huge willow mattress for sinking at pier site for bridge at New Orleans. (Right): Stall for mooring 500-ton floating caisson.



Meetings Ahead

ASSOCIATED EQUIPMENT DISTRIBUTORS — 37th annual meeting, Conrad Hilton Hotel, Chicago, Ill.; January 29-February 2.

SOCIETY OF AMERICAN MILITARY ENGINEERS — Annual technical meeting, Palmer House, Chicago, Illinois; February 9-10, 1956.

THE ASSOCIATION OF ASPHALT PAVING TECHNOLOGISTS — annual meeting, Hotel Cleveland, Ohio; February 13-15, 1956.

ASSOCIATED GENERAL CONTRACTORS OF AMERICA — Annual Convention, Waldorf-Astoria Hotel, New York, N. Y.; February 13-16, 1956.

NATIONAL READY MIX CONCRETE ASSOCIATION — Annual Convention, Conrad Hilton Hotel, Chicago, Ill., February 13-16, 1956.

NATIONAL SAND AND GRAVEL ASSOCIATION — Annual Convention, Conrad Hilton Hotel, Chicago, Ill.; February 13-16, 1956.

NATIONAL CRUSHED STONE ASSOCIATION — Annual Convention, Conrad Hilton Hotel, Chicago, Ill.; February 20-22, 1956.

ILLINOIS HIGHWAY ENGINEERING CONFERENCE, University of Illinois, Urbana, Ill.; February 28, 29 and March 1, 1956.

ASSOCIATION OF HIGHWAY OFFICIALS OF NORTH ATLANTIC STATES — 31st annual meeting, Hotel Statler, Boston, Mass., Feb. 29 - March 1.

ILLINOIS TRAFFIC ENGINEERING CONFERENCE, University of Illinois, Urbana, Ill.; March 1-2, 1956.

AMERICAN CONGRESS OF SURVEYING AND MAPPING — annual meeting, Shoreham hotel, Washington, D.C.; March 18-24.

PURDUE UNIVERSITY — 42nd Annual Road School, Lafayette, Ind.; April 2-5.

CHEHAK PROMOTED BY LINK-BELT SPEEDER. N. V. (Norb) Chehak, formerly district representative in the Pacific Northwest and Canada, has been appointed assistant sales manager of Link-Belt Speeder Corporation, Cedar Rapids, Ia.

LEY APPOINTED DISTRICT REPRESENTATIVE. Gordon Ley has been appointed district representative for the Colorado area for Electric Steel Foundry Co., Portland, Ore.



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Court Decisions That Affect Your Job

Highway construction delay

By William Hurd Hillyer

A State highway department, acting through a private contractor, may construct highway and close streets with city's permission, Court of Civil Appeals of Texas has ruled. Furthermore, a municipality has the legal right to give such permission. Any inconvenience or damage that adjoining or abutting property owners may suffer from these temporary obstructions must be endured without legal relief, unless (1) lacking authority the contractor interferes with highway, or (2) he prolongs the work unduly.

In subject case, a merchant sued contractor and city for damages occasioned by loss of business stemming from unreasonable delay in completing a street-paving job in front of his store. Conformable with State Highway Contract the roadbuilding firm was constructing a two-mile section when a nearby river rose to record-breaking heights. Under the circumstances, testified the State Highway Department, there was no unreasonable delay in the contractor's work. Higher tribunal, concurring in this view, reversed District Court's decision against the contractor and transferred case to his own domicile, holding that both he and the city were within their rights.

R. B. Smith Appellant vs. W. E. Merrill & Sons, Appelle Court of Civil Appeals of Texas; 277 SW 2d 801.

Oral modification of written bridge contract

A Rhode Island woodworking company agreed to supply bridge treadways for use by the purchaser on a United States Government contract. The purchaser objected to the manufacturer's estimate of \$85.64 per treadway as too high but agreed orally that if the manufacturer failed to make a reasonable profit at \$67.00, he would pay the manufacturer half of his own profits in the sale of the treadways to the government.

Instead of a profit this manufacturer suffered a loss and asked the buyer for the share of the profits he had agreed to pay. This the buyer refused and the manufacturer sued on this oral agreement.

The Rhode Island court denied the manufacturer a recovery of a share of these profits under that oral agreement. "It is well established here as elsewhere," said the court, "that in the absence of fraud or mistake oral understandings cannot vary, alter or contradict a written agreement."

"The purpose of the rule is to enable parties to make their written contracts the only evidence of their undertakings and to protect themselves against the hazard of uncertain oral understandings in respect to their engagements."

Supreme Woodworking Co. v. Zuckermanberg, 107 A.2d 287, R.I., July 30, 1954.

Delivery of road supplies

A contract for the construction of 11.172 miles of highway was made by the State of Idaho and a subcontract made for the delivery and spreading of crushed gravel.

The defense of the general contractor to a suit by a materialman for \$5,139.96, representing more than 250 different items of gas, oil, tubes, tires and repairs, was the absence of any proof of actual delivery and use of these items in the performance of this subcontract.

Charge slips however had been made out by the general contractor for items of this character furnished to this subcontractor who had been engaged on the only highway construction job in that vicinity. The appellate court sustained a judgment in favor of the materialman.

"It is not necessary for a materialman to prove by direct evidence that his supplies, sold for the construction of a highway which were reasonably suitable and proper to it, were in fact so used, if this may be inferred from the circumstances."

State v. H & K Construction Co., 274 P. 2d 1002, Idaho, October 7, 1954.

On right of access

The owner of a 272.25 acre tract of land in Texas, conveyed 31.8 acres to a purchaser. At the time of transfer a road gave the purchaser access to a public highway. However in the construction of Granite Shoals Dam this roadway was flooded leaving the only access to the highway across the land of this former owner.

The owner sued for an injunction against the use of his land for that purpose. The Texas court denied him the right to prevent the opening of the roadway.

"It is to the public interest to see that every citizen has a way to and from his land and his residence in order to enable him to discharge the duties he owes as a citizen to the public. Some of these duties are mentioned in the state statute and their constitutionality rests upon the obligation of the sovereignty to afford to each member of the community a reasonable means of enjoying the privileges and discharging the duties of a citizen."

Phillips v. Stockton, 270 S.W.2d, 266, Texas, June 23, 1954.

Road was unauthorized

The owner of a Texas ranch deeded all but thirty acres of the tract to the Lower Colorado River Authority, which was later flooded by the Granite Shoals Dam. The land owner applied for the opening of a road from this lake to the public highway across adjacent property.

The Texas court in forbidding the opening of this road said, "The obligation rests upon the state to afford each family means of enjoying the privileges and discharging the duties of the citizen."

If the facts disclosed that this land owner's sole and only means of ingress and egress had been cut off, the court would have authority to enter the order. It does not lie within the power of the court to condemn a highway across this adjoining ranch to enable this land owner to establish a fishing camp. To do so would be taking private property for a private use."

Phillips v. Naumann, 275 S.W.2d 464, Texas, February 16, 1955.

Oiled highway liability

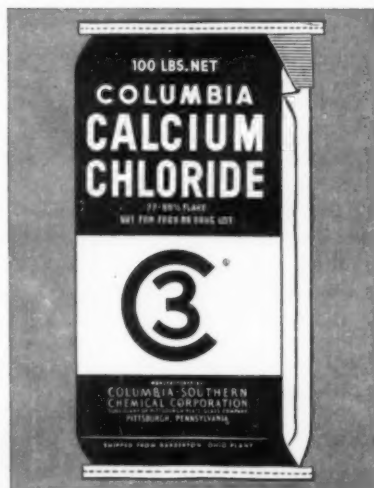
The driver of an automobile enroute from San Angelo to Sterling City, Texas, was directed by a traffic sign to a roadway wet with rain and covered with a fresh coat of oil. The car skidded, made several complete turns and collided with a truck, severely injuring a passenger.

The Texas court said of the contractor's liability, "A contracting company paid by the state to apply oil or tar to the surface of a highway may incur liability for failure to warn travelers properly of such application where the oiled surface begins."

John F. Buckner & Sons v. Allen, 272 S.W.2d 929, Texas, November 7, 1954.



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... for more details circle 191, page 14

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These roads when not properly treated cause motorists to be tardy for work which results in substantial losses in wages and production.

By treating cinder or sand stockpiles with 3-C Columbia Calcium Chloride, the abrasives are ready for quick, easy spreading at the first winter emergency. There are no frozen stockpiles.

Abrasives treated with 3-C imbed themselves in icy surfaces for better traction. Help prevent skidding. Abra-

sives do not blow away. Dangers are greatly reduced. Motorists are happy. Experiments show that calcium chloride treated abrasives stretch three times farther than untreated abrasives.

If desired, 3-C Columbia Calcium Chloride may also be applied directly to ice for quick melting.

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Whether the job is building a mountain trail, a farm to market road or a modern super-highway, there is a size and type of Euclid earth moving equipment to do the job fast and economically.

For example, Rear-Dump "Eucls" for hauling rock and heavy excavation range in payload capacity from 10 to 50 tons . . . Bottom-Dumps carry heaped loads of 15 to 30 cu. yds. of earth, gravel and free flowing material . . . self-powered Scrapers pick up and haul

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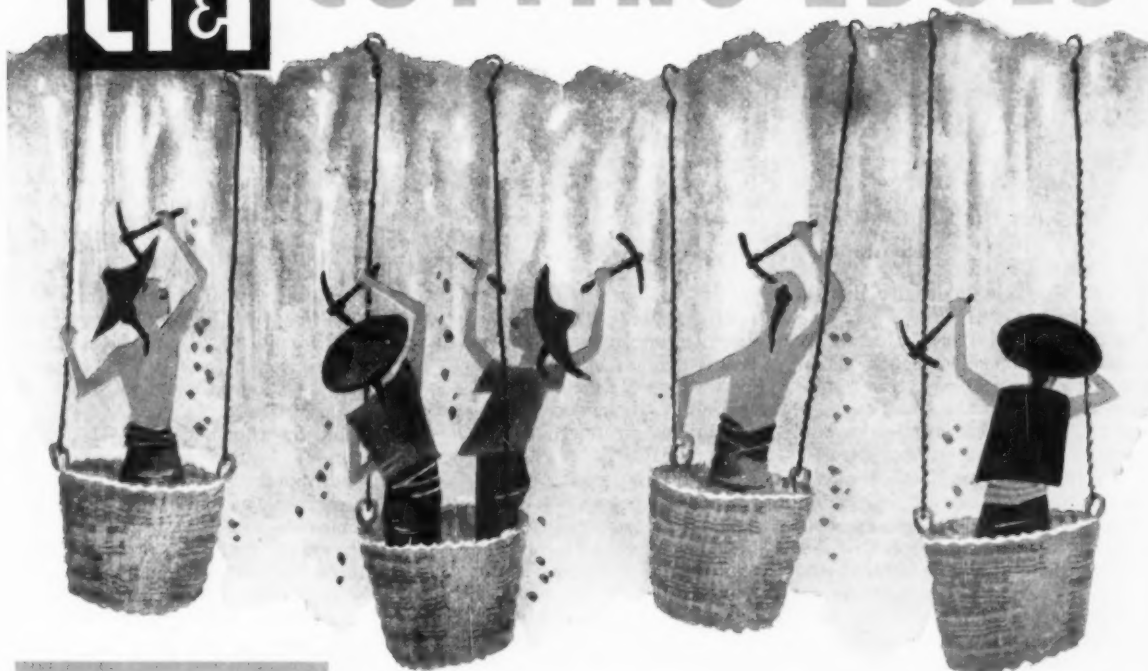
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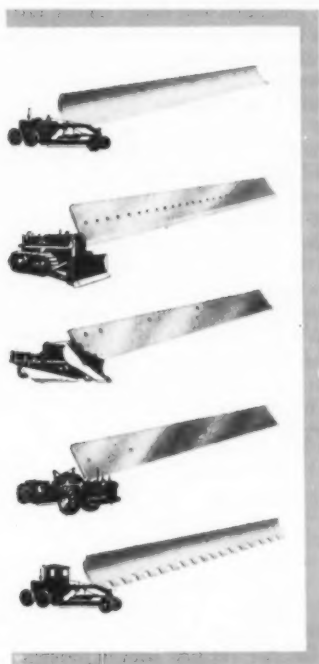
... and 10,000 Chinese laborers

America's first transcontinental railroad is a monument to the men who built it. The magnitude of their task is almost inconceivable. Chinese laborers, for instance, hacked out a portion of the roadbed while squatting in baskets hanging over the side of cliffs.

Fortunately, today's contractor has modern earth-moving equipment at his disposal—mechanical giants that do the work of 10,000 men. And these giants stay on the job only because suppliers throughout the nation provide quality parts to keep them running. Parts such

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Rolled from special analysis open hearth steel that is carefully selected for its toughness and abrasion resistance, CF&I Cutting Edges are available in a wide range of lengths, widths, thicknesses and hole spacings; flat or curved; with beveled or square ends, and in a variety of finishes. All are products of CF&I's quality control program that's complete—from ore through finished product.

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... for more details circle 190, page 14

ROADS AND STREETS, January, 1956

91

Perforated Concrete Subdrains

Installed to Correct Pumping of Runway Pavement

Example of drainage design and specifications for controlling water table under an exacting airfield pavement area.

LIKE many other cities that thought they were getting a bargain, the City of Richmond, Virginia, found that an airfield designed for fighter planes was not necessarily adapted to commercial operations.

Prior to World War II, the city operated a small airport six miles east of the city with one 4,000 ft. paved runway. In 1941, the city leased the airport property to the government. Additional land was purchased by the government to develop a fighter base. In addition to a contourment three 6-in. concrete on 10-in. gravel base runways each approximately 5,000 ft. long by 300 ft. in width with 1,000 ft. stabilized end-zones were constructed.

In 1947, the airport with all improvements and additional land was returned to the city under a quit claim deed, the government retaining certain rights as to the use of facilities for a period of 20 years. Since then the city has spent large sums of money to convert the facilities to suitable commercial standards. In 1950, a \$1,000,000 terminal building was opened, a new concrete parking ramp was completed in front

of this building, and high intensity lighting was installed on the instrument landing runway. The following year medium intensity lighting was installed on the main runway.

In 1947, Richmond was served by one airline operating two DC-3 flights daily. Today it is served by four major airlines and one feeder line. Schedules have increased to 60 flights daily. The feeder line will probably continue to use DC-3's for some time; only one of the major carriers continues to use DC-3's which will soon be replaced by heavier aircraft. Planes now in use by the carriers range from 44,000 to 88,000 lb. maximum gross take-off weight. Some government aircraft using the field have a maximum gross take-off weight in excess of 200,000 lb.

The airport location is commonly referred to as high-level swamp. The entire area is flat with poor draining soil. When the field was constructed an extensive storm drainage system was built with numerous catch basins installed on the landing field; the storm sewer outfall is 96 in. in diameter. No subsurface drainage was provided under the pavement.

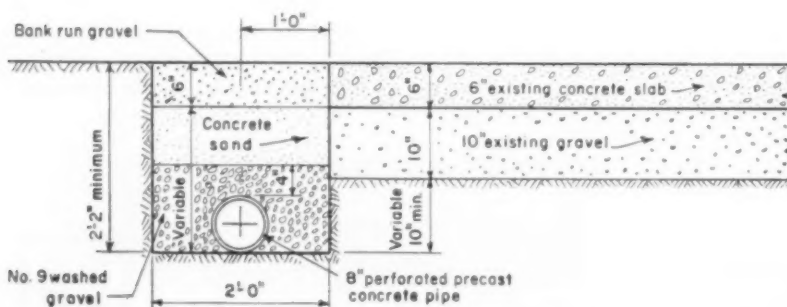
Several years ago considerable pumping action began to be noticed on some sections of runway 6-24, the instrument landing runway. General-

ly this runway is used only when flight conditions require it, however, use at that time is frequent. Not only are flights regularly scheduled for Richmond landing, but many flights are diverted to Richmond from other airfields closed on account of weather. Usually these weather conditions are caused by rain which in many cases continues throughout the period of heaviest use.

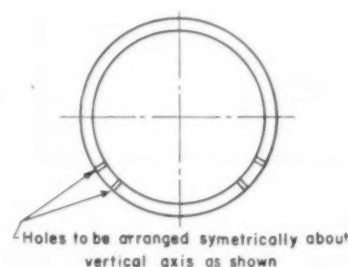
In the summer of 1952, during periods of extreme hot weather, two entire sections of the pavement were literally blown out of the runway. Examination of the base indicated that the gravel was extremely wet although there had been no rain for several weeks. Some of the concrete surface was spalled and much of the joint filler material had deteriorated. The same condition was noted on the taxiways leading to the terminal building. It was not uncommon to see geysers of muddy water spurt 30 or 40 ft. in the air when a plane passed over a joint.

Consideration was first given to installing trench drains under the runway and taxiway pavement, tying them in to the existing storm sewer system. Estimates indicated this not only would be costly since it meant considerable cutting and restoration of pavement, but appeared impractical when it was learned that test borings of the pavement and base previously taken indicated that the gravel base was not a uniform 10 in., but varied in depth up to 36 in.

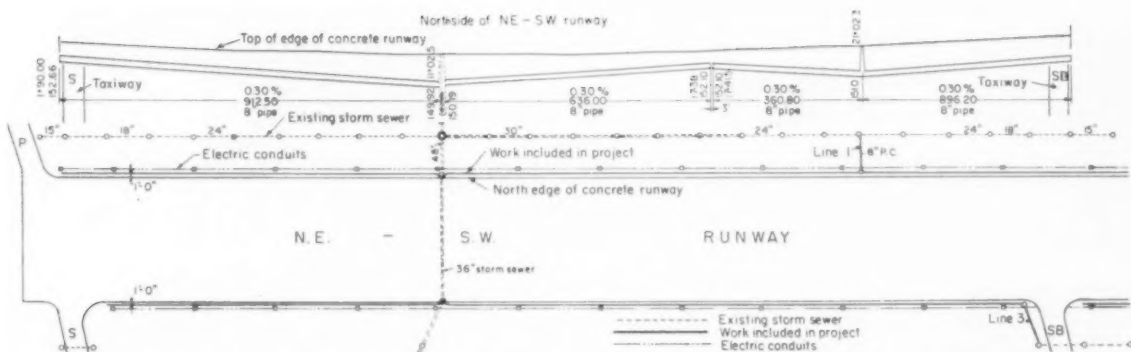
This is the second of two articles on the modernization of Richard E. Byrd Flying Field. See article, "Bituminous Overlay Strengthens War-time Fighter Base for Modern Commercial Aircraft," ROADS AND STREETS, October, 1955.



● Figure 1. Typical section through trench along edge of runway showing construction details.



● Figure 2. Detail of 8 in. perforated concrete pipe.



● Figure 3. Top, profile of subsurface drains SW end of Runway 6-24. Bottom, plan of SW end of same runway showing location of existing storm sewer system, location of electric conduits and subsurface drainage trench.

Plans were then prepared for installing perforated pipe in washed gravel below the bottom of the gravel base and parallel to the edges of both sides of the runway and terminal taxiways. Due to the flat grades it was necessary to vary the direction of flow of the pipes to reach existing manholes near the edges of the pavement.

Specification Details

Alternate bids were asked on perforated concrete and metal pipe. The following special provisions governed this work:

Miscellaneous Provisions. All non-perforated concrete pipe joints were required to be made with cement mortar and wrapped with oakum or jute. Gaskets were not required for the perforated concrete pipe joints, which were made only with cement mortar.

Tapping into the existing sewers or manholes was included in the contractor's bid per lineal foot for laying pipe.

All plain concrete pipe was required to meet the Standard Specifications for concrete sewer pipe, AASHTO Designation M86-49.

Perforated Concrete Pipe. "In addition to conforming to the standard specifications for plain concrete sewer pipe, AASHTO Designation M86-49, the pipe shall be perforated as follows:

"Perforations shall be circular and $\frac{1}{4}$ in. (plus or minus $\frac{1}{16}$ in.) in diameter, spaced approximately 3 in. center to center in rows parallel to the axis of the pipe. The holes shall be cleanly formed and present full opening. No holes shall be placed in the spigot and for a length equal to the depth of the socket.

"The total number of rows shall be four for an 8-in. pipe and shall be arranged in two equal groups, one on each side of the vertical centerline of the pipe.

"The longitudinal rows of perforations shall be symmetrical about a diametrical axis and located in one semi-circumference. The limiting rows will be separated by an arc of 90 degrees and an arc of at least 160 degrees and less than 180 degrees."

Perforated Metal Pipe. Required to meet the Standard Specifications for Corrugated Metal Pipe Underdrains, AASHTO Designation M136-47. And also to be coated with asphalt cement meeting the following requirements:

"The pipe shall be uniformly coated, inside and out, to a minimum thickness of 0.05 of an in., measured on the crest of the corrugations. The perforations must not be stopped up but shall present full openings. The bituminous material used for coating and its application shall conform to all requirements of the AASHTO specifications."

Materials for backfilling trenches is shown in the typical section (Figure 1).

Bank Run Gravel. The gravel shall be hard, sound particles of stone, all of which will pass a $\frac{1}{2}$ in. sieve and not less than 25 percent shall be retained on a No. 4 sieve. The clay shall not be less than 12 percent and more than 25 percent."

Concrete sand was natural washed sand complying with the requirements for grade "B" concrete sand as specified in Virginia Department of Highways Road and Bridge Specifications. No. 9 washed gravel meeting highway department specifications for coarse aggregate was required.

The contractor was required to backfill the trench to a point 6 in. below the existing surface after each day's work. After completion of the backfill, the trench was compacted to secure a firm shoulder and to prevent the entrance of surface water. Backfill on the plain concrete nonperforated pipe was made with the excavated material.

Extreme care was required of the contractor to prevent damage to any under ground electrical conduits. In the event a conduit was cut, he was required to replace immediately the entire section from light to light at his own expense. Splicing the break was not permitted.

All work was required to be performed with special regard for maintaining constant and uninterrupted function of all airport facilities. The contractor was required to remove all equipment from the edge of the taxiway and runway upon completion of each day's work. Location for the parking of equipment was designated by the airport manager.

Specifications—Backfill Material Grade B Concrete Sand

Sieve numbers	Percent passing
$\frac{3}{8}$ in.	100
No. 4	95-100
No. 100	0-10
No. 200	0-5
Square sieves	Percent passed
1 in.	100
$\frac{3}{4}$ in.	95-100
$\frac{3}{8}$ in.	30-65
Sieve numbers	Percent passed
No. 4	5-25
No. 8	0-5

In order to obtain maximum utilization from the subsurface drainage system it was most important that the trench surface over the pipe be completely sealed to prevent the entry of surface water, since this water was adequately handled by the numerous catch basins. It was also essential that the perforated pipe be below the bottom of the gravel base to effectively drain the water trapped beneath the runways and taxiways. Work along the runway was further complicated by proximity of the conduit and landing lights to edge of runway which somewhat limited the space where equipment could work.

(Continued on page 109)

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Here are the manufacturers represented in Gillette's Heavy Construction Prefiled Catalog:

Aerofil Products Company	Heltzel Steel Form & Iron Co.
American Steel & Wire Div.	Henry Manufacturing Co., Inc.
Anthony Company	Hogan Company
Armco Drainage & Metal Products, Inc.	Hough Company, F. G.
Austin-Western Company	Huber Manufacturing Co.
Badger Machine Company	Ingersoll-Rand
Barber-Greene Company	Jackson Vibrators, Inc.
Bicknell Manufacturing Co.	Joy Manufacturing Company
Blaw-Knox Company	Keystone Asphalt Products Company
Briscoe & Son, E. B.	Kiesler Company, Jos. F.
Bros Boiler & Mfg. Co., Wm.	La Crosse Trailer Corporation
Buffalo-Springfield Roller Co.	Le Roi Company
Butler Bin Company	Littleford Bros., Inc.
Carrey Manufacturing Co., Philip	McKiernan-Terry Corporation
Chrysler Industrial & Marine Engine Corp.	Mid-Western Industries, Inc.
Clark Equipment Company	Minneapolis-Moline Company
Cleveland Trencher Company	Naugatuck Chemical Div.
Colorado Fuel & Iron Corp.	Owen Bucket Company
Concrete Surfacing Machine Co.	Pacific Car & Foundry Co.
Continental Motors Corporation	Pioneer Engineering Works, Inc.
Cummer & Son Co., F. D.	Reliance Steel Products, Inc.
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Heil Company	Wico Electric Company
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Nearly **200** "EUCS" already at work on the

*St. Lawrence
Seaway*



Model 63TD "Euc" getting a heaped load of 20 cu. yds.
at site of Long Sault Dam near Massena, N. Y.

Although work on the St. Lawrence Seaway and related New York Power Authority projects is just getting under way, close to 200 Euclids are already "digging in". They're helping build cofferdams, making diversion cuts, relocating highways and railroads, and preparing power house sites. Other "Eucs" are doing similar jobs on the Canadian side of the river.

One of the key projects in the whole Seaway program is construction of Long Sault Dam near Massena, N. Y., a joint venture sponsored by Walsh Construction Co. Others who have pooled their men and machines on this 7 million yard job are B. Perini & Sons Co., Morrison-Knudsen Co., Peter Kiewit Sons Co. and Utah Construction Co. . . . some of America's leading contractors. At present 50 "Eucs" are working on this one contract and others will be added as work progresses.

Eight of the Euclids are 22-ton Rear-Dumps with 300 h.p. engines and Torqmatic Drives. They were selected for this job because of their ability to haul big loads at fast

travel speeds day in and day out . . . with less down time for servicing and repairs. That's the kind of performance that has made "Eucs" the preferred equipment for hauling heavy excavation on the toughest jobs everywhere . . . it's one of the important reasons why **EUCLIDS** are your best investment.



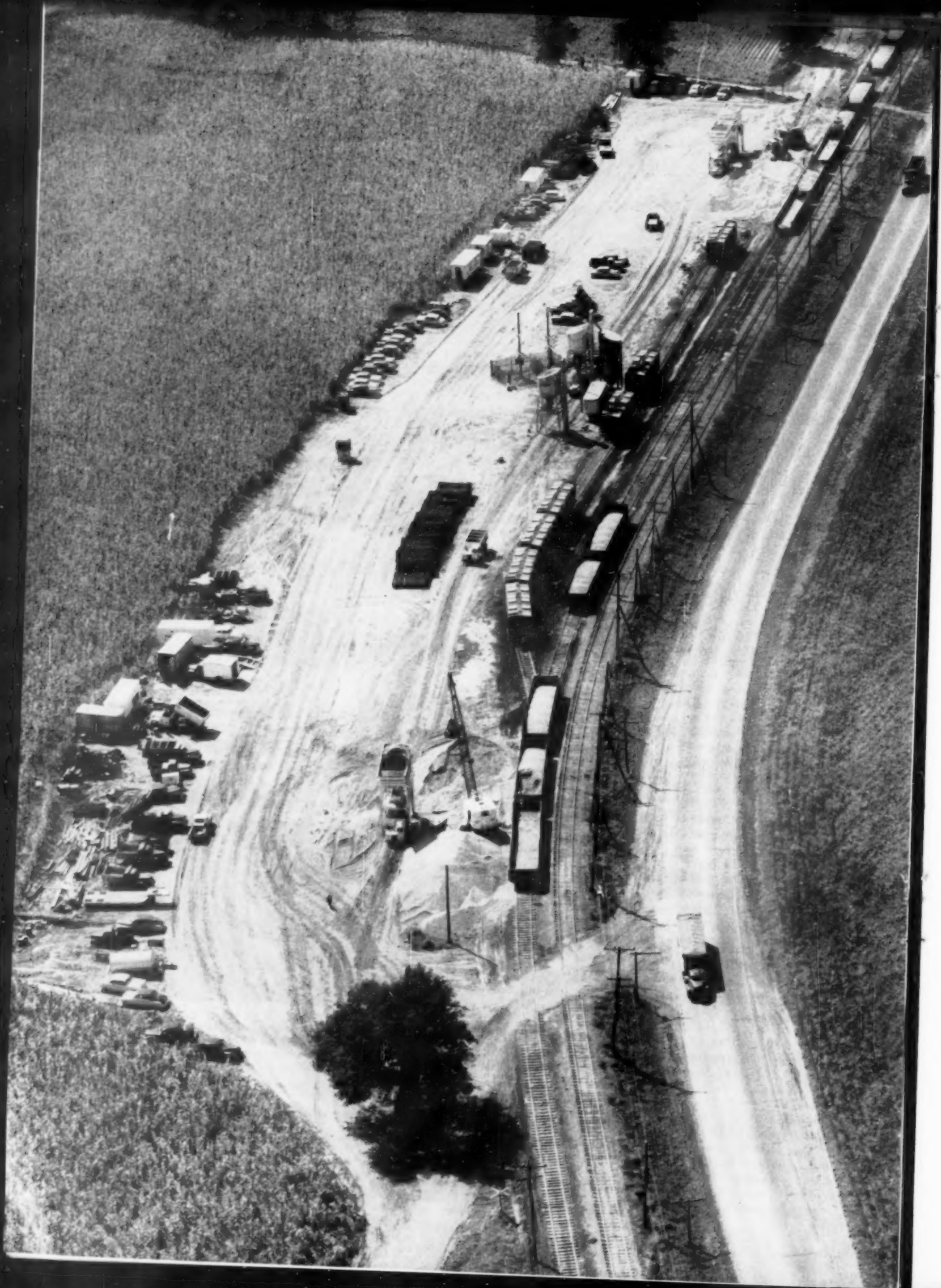
Torqmatic Drive and 300 h.p. make this "Euc" a top performer. Torque Converter and semi-automatic transmission eliminate manual shifting—utilize full engine power at all times.

EUCLID DIVISION GENERAL MOTORS CORPORATION, Cleveland 17, Ohio

Euclid Equipment

FOR MOVING EARTH, ROCK, COAL AND ORE







● Unusual aerial photograph of the Hoeffken paving job, showing how third paver was used to balance out by placing the top lift on the wire mesh.

3-Paver Outfit Makes Big Footage

Knockin' Out the Yardage

CONTRACTORS on highway work in various states tried 3-paver operation in 1955, with success. One of these was M. Hoeffken Co. and Hoeffken Bros., Inc., of Belleville, Illinois. The project near Hamel, Ill., consisted of 7.634 miles of portland cement concrete, in the progressive 4-laning of U.S. 66, the main artery between Chicago and St. Louis.

The project was awarded on June 14, 1955. Grading and drainage structures were started immediately. The grading consisted of 584,000 cu. yd. of borrow and earth excavation.

Paving was started on August 18. Two 34-E dual drum pavers were used on the first 16 days of concrete placement, then a third paver added.

● (Opposite page): How a modern large-capacity batch plant looks from the air. Note straight in-line path of batch trucks under sand, cement and stone hoppers.

The best day's run (8 hours) for two pavers was 1,735 ft. of 24-ft. by 10-in. pavement. The average hourly rate for two pavers was 170 ft. The best day (10 hours) for three pavers was 2,754 ft.; the average hourly rate 261 ft.

Due to the wet autumn and early cold weather, the contractor was unable to complete the pavement in 1955. Paving operations were stopped on November 9, when approximately 85 percent finished. Traffic cannot use the pavement until the section to the south is constructed; therefore, completing the pavement this year was not a critical matter.

Two mixers were used to pour the 7½-in. bottom course. Mesh was placed on this course, then the rear or third mixer placed the top 2½-in. lift. The balance of the road equipment consisted of two mechanical spreaders (second spreader having a surface

vibrator), concrete finishing machine, mechanical longitudinal float, and two burlap drags.

The plant equipment consisted of two dual course aggregate batchers, one dual automatic cement batcher and a single manual operated cement batcher, and one dual sand batcher. Three cranes were used in handling the materials. These notes were supplied by Robert H. Tittle, Engineer of Construction, Illinois Division of Highways.

The contractors have supplied the following more detailed outline of the equipment and plant employed:

Shape Grade: 2 Caterpillar 12 motor graders.

Spread Granular Base: Jersey spreader (Model 101) attached to Caterpillar D8.

Compact Base Material: Case tractor, with Grace pneumatic roller.

Paving Forms: 9,000 lin. ft.

Personals

EMORY M. FORD, chairman, Huron Portland Cement Co., Detroit, was re-elected board chairman of the Portland Cement Association at its recent annual meeting in Chicago.

New directors elected are C. S. Crawford, of Whitehall Cement Manufacturing Co., and Allan B. Sunderland, of Ash Grove Lime and Portland Cement Co.

THEODORE J. KAUER has resigned, effective December 31, as chief engineer of the Ohio Turnpike Commission. He directed the construction of the \$350 million Ohio Turnpike recently opened to traffic. Kauer was

(Continued from page 97)

Form Grader: Carr.
Form Pin Driving: Hand labor.
Form Handling: 1 Nelson Dowell form loader; 2 trucks.
Subgrader: Buckeye.
Roller Between Forms: Galion 8-ton.
Haul Reinforcing: 2 Ford semi-trailers.
Sprinkler Trucks: 2,500-gal. tanker.
Pavers: 3 Koehring 34E dual-drum.
Spreaders: 1 Blaw-Knox Model SD; 1 Jaeger CS20.
Vibrator: Jackson, pan-type, mounted on Blaw-Knox spreader.
Finishers: 1 Jaeger, Type D, tandem screed.
Longitudinal Float: Koehring Model 2A.
Water Supply: 6 — 3,000-gal. water trailers for the 3 pavers.
Curing: Sisalkraft paper.
Joint Seal: 1 Lincoln Model 77, joint sealer.
Batch Trucks: 12 Ford (3-batch); 14 Diamond T (4-batch).
Air Entrain: In cement.
Concrete Saw: Tri-Line saw.
Batch Plant: 2 Blaw-Knox 100-ton stone bins; 1 Blaw-Knox 100-ton sand bin; 1 Butler 250-bbl. bulk cement bin with twin electric weigh batcher; 1 Butler 250-bbl. bulk cement bin with hand-operated single weigh batcher; 1 Butler 400-bbl. bulk cement storage bin; 1 Koehring 405 crane with Owen 1½-yd. clam bucket; 1 Lorain L-50 crane with Owen 1½ yd. bucket; 1 Bay City 62 crane with Owen 1½ yd. bucket.
 Project superintendent for Hoefken was N. E. Walters; Wm. T. Willis and Erwin Stahl were foremen; Richard Caldwell, subgrade and form-setting foreman, Ervin Krausz, batch plant foreman; Leroy Krupp, curing foreman.

Ohio director of highways and an ex-officio member of the Turnpike Commission when it was organized in 1949, later resigning to become chief engineer. He also served as the first secretary-treasurer of the commission for three years.

Kauer played a major role in establishing the design standards for the Ohio Turnpike and for seeing that these standards were maintained during the recent construction program.

A. I. SAVIN has been elected a vice president of Merritt-Chapman & Scott Corporation. He will serve as an officer for the company's Construction Department, headed by William Denny, executive vice president. Mr. Savin is president and treasurer of the Savin Construction Corporation, of East Hartford, Conn., and its subsidiary, The Whaling City Dredge & Dock Corporation, of Groton, Conn., which have become divisions of M-C & S.



A. I. Savin

A. LEE GROVER has retired as director, division of administrative services, New Jersey state highway department. One of the leading highway administrative figures in the East, Mr. Grover was employed in 1913 as an accountant with the former New Jersey department of public roads. He became secretary when the present state highway department was organized. On the 25th anniversary with the department he was tendered a testimonial dinner by nearly 1,000 of his friends.

Mr. Grover has served as secretary and treasurer of the Association of Highway officials of the North Atlantic states from its organization in 1924 until the present. He was a past director of the ARBA and trustee of the State Employees' Retirement System.

Commissioner Dwight R. G. Palmer has named Kenneth D. Rice as acting secretary and chief clerk to fill the vacancy.



A. Lee Grover

RALPH J. LEHMAN has been appointed chief engineer of the Ohio Turnpike Commission, succeeding T. J. Kauer, who resigned recently to enter into other work. Lehman has been assistant chief engineer since 1953, and was formerly with the Ohio Department of Highways.

JAMES C. JOHNSON, District Engineer for The Asphalt Institute at Oklahoma City, has been appointed to the Institute's headquarters staff at College Park, Maryland. He will assist Chief Engineer, A. S. Wellborn on special problems in asphalt engineering and soil stabilization.



James C. Johnson

• Truck travel on the nation's roads and streets increased 112% in the 1940-54 period; passenger cars 81%; buses 65%, according to the Bureau of Public Roads.

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USF Universal-Beam . . . a new companion to the nationally famous safety top USF Barrier-Beam Guard Rail . . . now provides another effective contribution to the cause of highway safety.

This new Universal-Beam Guard Rail in either 10 or 12 gauge is an interchangeable, rugged deep beam section offering maximum protection, excellent visibility, and high impact strength.

Universal-Beam's wide center corrugation serves as a bumper guide and the edges are turned back for safety. The wide lap joint assures high beam strength.

Easy erection is obtained on any type of post due to the wide splice bolt pattern and erection is speeded by use of the long slotted post bolt hole. The oval neck bolts so popular with users of Barrier-Beam rail afford maximum joint strength and quicker erection. Universal-Beam lays in either direction of traffic.

For fast easy erection, low cost maintenance and safety, specify—

USF Universal-Beam Guard Rail

Write for Engineering Data

. . . for more details circle 236, page 14

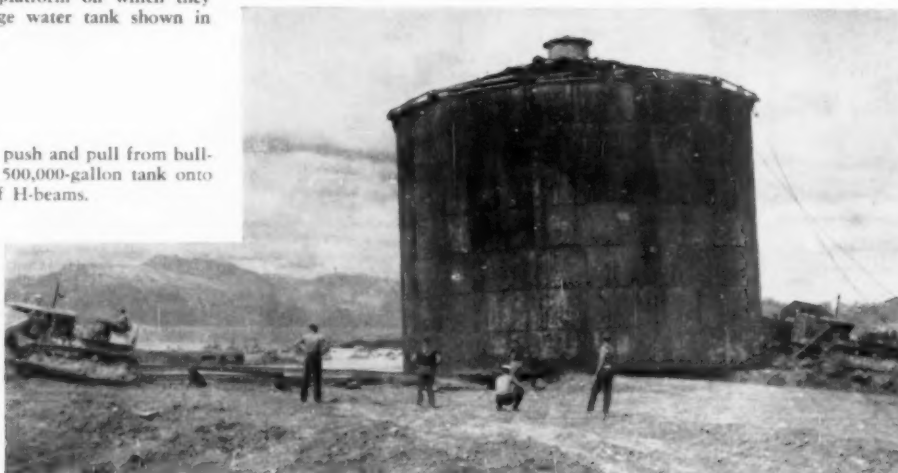
ROADS AND STREETS, January, 1956



- Seabees weld skid platform on which they intend to move large water tank shown in background.

- It took considerable push and pull from bulldozers to move the 500,000-gallon tank onto the skid platform of H-beams.

Huge Asphalt Tank



Contractors who sometimes have tough transport jobs may be interested in this account of how a Seabees Mobile Construction Battalion moved a 500,000-gallon steel tank down a 250-foot hill, across a Bay and to a paving plant site.
Editor's Note.

By Lt. Robert C. Mabbitt, CEC, USN

FOR more than three years the 500,000 gal. water tank atop Mount Maritan presented a challenge to the imagination of Cubi Point engineers in the Philippines. A familiar landmark in the Subic Bay area, it had stood there since World War II. In turn, plans were formulated to use it as a cement storage, as an auxiliary water tank, and as an asphalt storage tank. But in each case there remained the drawback that the gargantuan tank's location was 250 ft. up an almost 75% slope.

"Just give it a little push and let it slide down by itself" . . . ? The planner had only to climb the hill and crawl into the inspection hole in the side of the tank for his tone to change to the dubious side. From the inside the di-

From article, "Seabees Can Move Anything, Anywhere, Etc.," The Civil Engineer Corps Bulletin, October, 1955.

mensions are vastly more impressive — 35 ft. high, 50 ft. in diameter, and 45 ft. above the bottom. The bottom and lower 20 ft. of the side are made of $\frac{1}{2}$ -in. boiler plate. The upper 15 ft. is of $\frac{3}{4}$ -in. plate. Of riveted construction, the tank's total weight, including the top bracing is 90 tons.

When the Seabees Mobile Construction Battalion MCB-3 returned to Cubi Point late in 1954, use of the tank for asphalt storage became of immediate importance, and the Battalion launched an attack on the problem.

Two schools of thought existed concerning the method of moving it. Some advised cutting the tank into sections and then rewelding the sections on the site. Others favored moving the whole tank. The decision to attempt the latter plan was based on the necessity of putting the tank to its new use as rapidly as possible.

It was a bold plan in the face of a slow but sure alternative. And when the Commanding Officer of MCB-3 made his decision it meant that a complete advance study of each step of the procedure had to be made. Critical points in the operation could be foreseen which had to be controlled, or chance losing the tank or causing injury to men and equipment.

In line with the purpose of using the tank at an asphalt batch plant within a few hundred feet of the shoreline came the decision to float the tank across the bay and beach it near the new site.

Influential in this decision were the facts that there was no weight-lifting equipment available to put the tank on low-bed trailers; that the 2-mile route by road was crossed by 19 overhead guys, powerlines, and telephone cables; and that a river bridge enroute would present difficulty.

The final plan called for sliding the tank down the hill, turning it, and towing it 300 yd. down the road, turning it again and pushing it into the bay at a favorable launching site.

Preparations were repeatedly reviewed. Many questions presented themselves.

How large and how strong should the skids be? Would the tank tip on the way down the hill? Would it be strong enough to retain its shape?

Goes to Sea



● Here the men launch the tank at low tide during greatest tidal difference.

● Tank at the bottom of the hill, giving an idea of the steepness of the slope over which they traveled.

Would it slide down hill by itself and if so how would it be held back? Could it be maneuvered onto the road and off again into the water without tearing up the skid? Would it float upright or tipped? Was the bottom strong enough to stand the pressure of floating? How much water would it draw? And lastly, could enough power be exerted to get it out of the water again and onto the shore?

Each problem was solved in turn by ENS Maxwell, the project officer, SWSC Funkhouser, in charge of rigging the tank for moving, and Dun-kee, CD1, who was in charge of the equipment employed in moving the tank.

A skid structure was erected alongside the tank onto which the tank could be pushed and secured. The skid was made of seven 50-ft. 12 by 12 H-beams, 4 on the bottom at 10-

ft. spacing and 3 on top at right angles to the others at 15-ft. spacing. Angle bracing was welded into every interior intersection, producing a very rigid structure. Towing shackles were attached to the front of each of the 4 runners at the bottom. Weight of the skid was 15 tons.

The first movement of the tank was disappointing. Three Caterpillar D8 dozers pushing and two D8's pulling resulted in one snapped towline and the exit of one badly frightened lizard — but no change in position of the tank. Then it was discovered that the dozers had dropped their blades to avoid putting the cutting edges against the tank and were trying to move about six inches of dirt along with it. When they raised the blades enough to bear against the bottom bounding angle of the tank, it slid into place on the skid with the rivet

heads on the bottom acting as casters.

● **Anchoring Tank.** Securing the tank to the skid was accomplished without piercing the bottom by welding pad eyes to the side and cinching it down to the skid with eight 3-ft. turnbuckles.

Two D8 tractors were chosen to lead the tank down the hill, and four dozers were attached to the rear of the tank to prevent its tipping or sliding onto the pulling tractors. Cables from the tank were led over the blades to the belly hook of the dozers so that they could apply the brakes simply by dropping their blades.

The tank went down with no trouble whatsoever, but once down it required all the pull and push of six tractors to turn it and to tow it down the road to the beach.

(Continued on page 108)

● Once across the Bay, eight tractors were used to pull the tank out of water onto Cubi Point beach.



● After sand blasting and painting, the tank was moved to the asphalt plant where it is now used for storage.

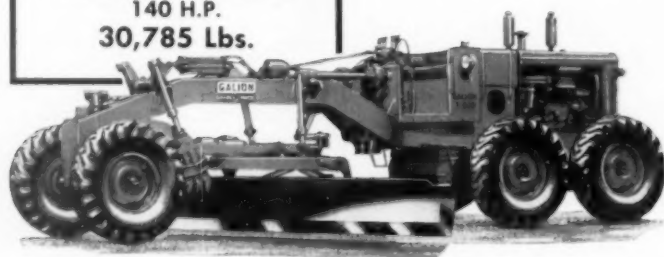


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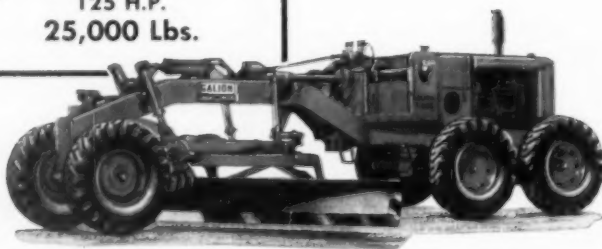


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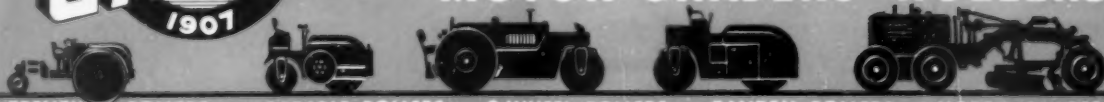
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... for more details circle 197, page 14



● Floor trusses in place on special suspension mountings, ready for rail shipment from fabricating site.

Huge Trusses Shipped Suspended

FLOOR trusses for the Walt Whitman Bridge, too deep for normal flatcars transport, are being shipped to Philadelphia between cars specially rigged and counterweighted, with bottom chords riding only 6 in. above the rails. The \$90,000,000 bridge will require 173 of the prefabricated trusses, 16 ft. deep by 87 ft. long. Most weigh 22 tons each.

Bolted to the flatcar deck is a special steel support frame, which provides a swivel plate extending out from the car so the truss will not interfere with car operation in transit. The truss, resting on a swivel plate at each end and held by a 2-in. pin, serves as a coupling between cars. A flexible air hose is wired to the bottom chord to connect the air braking system of the cars.

One shipping unit consists of two pairs of trusses pinned to either side of a center car, with a counterweight and car supporting the other ends. Counterweight is 15-ton concrete.

This shipping unit, used at Bethlehem's Pottstown plant for the first time, is 275 ft. long, including the two pairs of trusses and three cars. Shipments are being made in special trains of two units at a time, plus locomotive and caboose.

The first of 21 such special trainloads has been shipped. On return trips the cars are coupled with a special drawbar with flexible air hose.

Off shore, the floor trusses will be moved out on the Delaware River on car floats and hoisted to deck level by derricks on travelers.

●**Suspending the Roadway.** The 11,733 tons of roadway steelwork will be suspended from huge cables held aloft by two 370-ft.-high towers, one on each shore. In hanging the suspended structure, erection crews begin at the towers and work toward the center of the river. First move is to set up a guy derrick on the bottom strut of the tower. The derrick then erects floor sections in the tower, and is moved up onto this floor. From there, cantilevering out from the tower, it erects the first panel of roadway steelwork. On this panel the derrick will set up two 16-ton travelers which, upon completion of the cables and suspenders in April of 1956, will proceed to erect the remaining panels. Travelers working out from opposite towers will meet at the centerline of the bridge, which is the midpoint of the 2,000-ft. main span.

The two 770-ft. side spans will be constructed the same way — by a

separate pair of 16-ton travelers beginning at the tower and working toward the anchorage on shore. The side spans will be erected simultaneously with the main span steel.

●**Stiffening Trusses.** The main feature of the suspended structure is the two continuous open-webbed stiffening trusses running lengthwise of the bridge for its entire 3,770 ft. between anchorages. This trusswork is held up by pairs of suspenders spaced 40 ft. apart. The suspenders are lengths of wire rope 2½ in. in diameter suspended from the big cables, which themselves are 23½ in. in diameter.

At right angles to the two parallel lines of stiffening truss are placed the 173 floor trusses. On the floor trusses and at right angles to them rest roadway stringers 20 ft. long. Spaced 5 ft. 8 in. apart laterally, 16 of them will be placed in each panel.

The stringers support the deck slab, comprising a 5-in. steel grid flooring filled with concrete. This will be topped with a 2½ in. bituminous concrete wearing surface.

Because the stiffening trusses are erected member by member, no shipping problem arose in their case. The Delaware River Port Authority, plans to open it to traffic early in 1957.



● Drilling 30-in. shafts for the second or rear row of wells, which are shown in the accompanying diagram.

Connected Wells Installed

Corrugated perforated metal jet pipes, installed in vertical sand drains and tied across at the bottom, succeed in lowering water table in unstable hillside.

WHAT to do about an extensive hillside cut which showed slide tendencies, was a problem in constructing Mountain Boulevard Freeway in Oakland, California. This project which traverses Oakland's suburban Montclair area skirts a hill built up with fine homes. The occurrence of several slides early in the project led to change orders, resulting in a drainage installation designed to stabilize the hill and protect the adjacent property.

Relocation of Mountain Boulevard through Montclair as a limited access highway was first undertaken by the city and county and state on a co-operative basis by means of a Joint Highway District. This project is the second unit. In 1954, the Joint Highway District was dissolved and the project taken over by the California

Division of Highways as part of its freeway program for the Bay area. The state completed the plans and, early in 1955, awarded a 1.29-mile section to Charles L. Harney, Inc., of San Francisco. The contract involving a dual roadway and requiring 340,000 cu. yd. of roadway excavation was largely finished during 1955.

The principal concern over stability was centered in a portion of the hillside extending about 700 ft. along the highway, where small local slide-outs occurred during construction. The soil mantle here consisted of a hardpan clay with pockets of decomposed serpentine material. As a means of lowering the ground water and holding it at a safe level, it was decided to install vertical rock drains parallel to the roadway along the top of the fill. To drill the drain holes,

George F. Casey and Company, drilling specialists of Los Angeles, were brought into the picture. Using rotary rigs the procedure was to ream 30-in. diameter shafts, spaced 10 to 12 ft. apart. The walls were carried down 30 to 40 ft. through the stiff clay, to an elevation below the adjacent road-bed level. The bottoms were belled out by P & Z Company, of San Francisco. Belling was done to a diameter of about 6 ft. using a special belling tool on the auger plus hand spade work by a man lowered into the hole.

As each well was completed, 8-in. perforated corrugated iron pipe was set in the hole, and the space outside the pipe backfilled with granular material. Some of the pipe consisted of spiral corrugated sections with two or three rows of holes. At the bottom of each pipe a jetting device was installed and connected with a pumping system.

Supplementing this initial line of drain wells, a second parallel line was installed about 10 ft. back. The scheme here was to install pipes in



● Showing double 4-in. pipe in pumping system, with 1-in. hose lines to Pacific water jets down in the buried pipes; also view of two pumping stations.

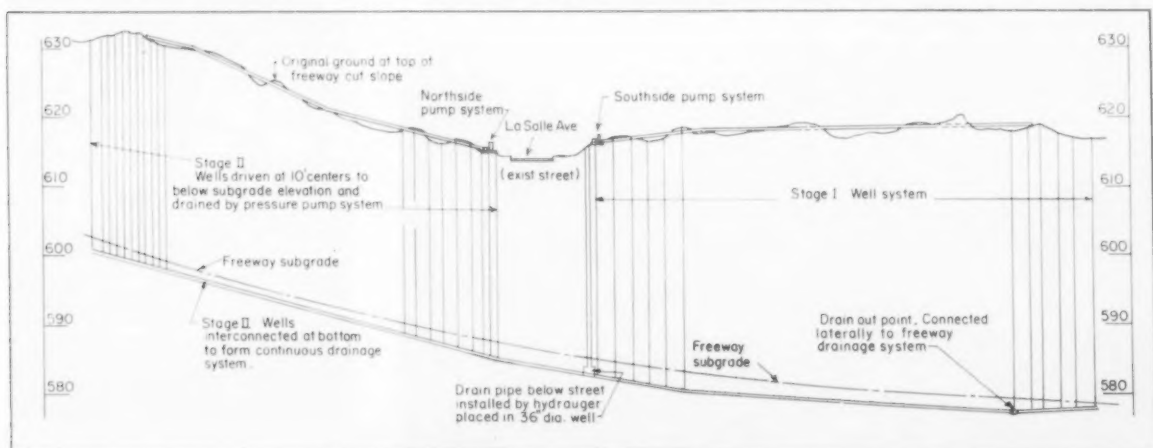
to Stabilize California Hillside

the holes spaced at 10 ft. intervals as before, to allow for pumping initially. Then intermediate holes were driven midway between the drains containing pipes, as access shafts, from which sections of 8-in. corrugated perforated pipe were installed horizontally to in-

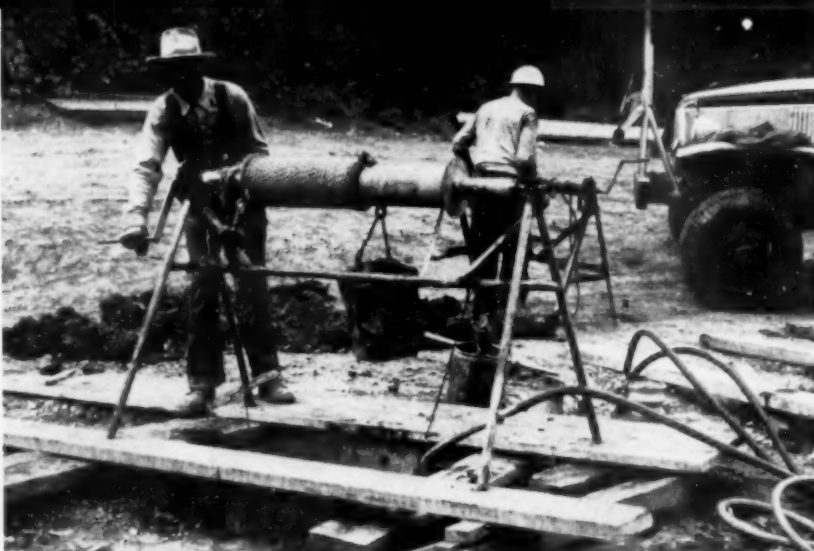
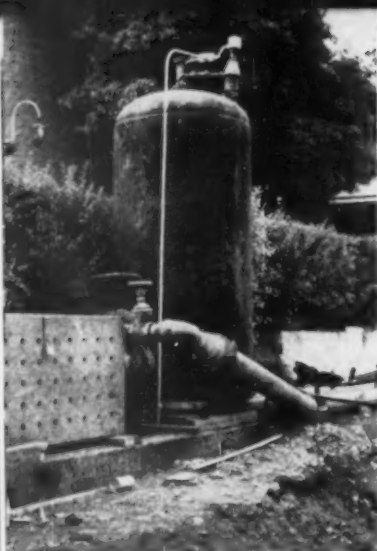
terconnect the bottoms of the wells. By this means an underground collecting drain was created tapping the bottoms of the wells. The gradient was somewhat irregular, being adapted at times to the bottom elevations of the holes, but averaged about one per-

cent. The intermediate shafts were backfilled with drain rock without pipes.

About 120 drains with pipes and 100 access shafts were dug thusly for the two lines, using first one then two drill rigs manufactured by California



● Profile of drain wells, showing how drains were connected at bottoms to tap ground water in unstable hill.



- Winch for bringing up spoil from belling operation. Also another view of the pumping stations for water jet system.
- Unstable nature of hillside cut along Mountain Boulevard Freeway is shown by the slide pictured here.



- General view of freeway line, unstable hill being at right. Pile rig is setting piles for pedestrian overpass.

Welding and Blacksmith Company, or by Williams. Holes were dug at the rate of about 150 lin. ft. per 8-hour day per rig, including the belling.

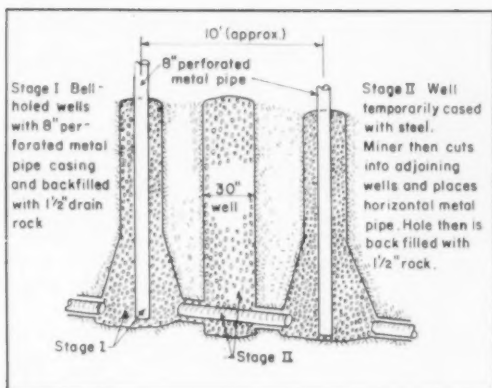
Two electric pumping systems of 20 and 30 hp. capacity were installed on opposite sides of a cross street as pictured. Each was tied to 50 to 60 drain pipes by means of a 4-in. steel supply pipe and return line and 1-in. plastic pressure hose lines. The systems were designed for initial pressure of 35 psi. at the beginning of the line. The Pacific jet system used in each well is a device which creates a slight vacuum or drop in pressure, acting to suck accumulated ground water in with the pressure flow.

Beginning immediately after installation, state engineers took soundings every day or so in each well. From the readings, a progressive ground water profile was charted to



- The 16-in. auger used on the pile-setting job by George F. Casey Co.





- Drain-out pipe, leading from main collection line to new storm sewer.

determine the progress in dewatering the hillside. Ground water immediately dropped to levels 15 to 30 ft. below the top of the cut. The objective was to eventually pull the level as low as 35 to 37 ft. The pumps were considered to be a temporary expedient until gravity flow could be established along the bottom collecting line in the back row.

The collecting drain was tied into a transverse lateral leading to a drain-out point. This section was installed partly by means of access wells, as described above, and partly by use of a Hydrauger.

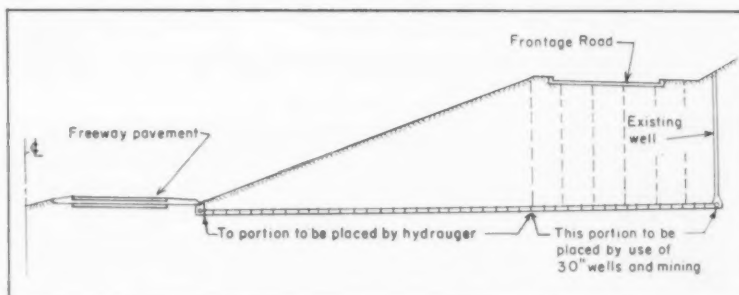
The hillside drainage and pavement surface drainage outlets finally to a 33-in.-diameter concrete storm sewer installed along the ditch line. Sewers were placed by McGuire & Hester, using a Buckeye Model 160 ditcher which had been equipped with extra wide (56-in.) cutting buckets and fitted with a Caterpillar D318 diesel engine.

The Casey organization's rotary drills found additional work on the project in drilling holes for piling, used for vertical shoring during excavation for concrete crib retaining wall. Rather than drive piling and risk bringing on slides from the vibration, it was decided to drill 16-in. holes 10 ft. below bottom of the crib-wall trench and set the 10-in. H-piles in place. After 25 such piles were installed in two rows along the back and front edge of excavation, going to depths of 20 to 40 ft.

C. V. Clayton superintended the project for Charles L. Harney, Inc. Charles R. Nordfelt was resident engineer for the California Division of Highways, under the San Francisco district, directed by B. W. Booker, assistant state highway engineer and staff.



- Concreting junction boxes for corrugated pipe run-down on 100-ft. stepped cut slope. Link-Belt Speeder crane handling Gar-Bro bucket.



- Details of vertical drains, showing how intermediate access wells were dug to permit inserting pipe connectors in bottom.
- Drilling 16-in. holes through clay for setting H-piles as trench walling, for installation of concrete crib retaining wall.



FORERUNNER of PROGRESS



Contrast this early model Rogers Trailer hauling a 6 ton transformer over mountainous roads with a present day model equipped with the remarkable quick, detachable gooseneck.

The contrast graphically illustrates the vast improvements that have been made in the large and diversified line of

ROGERS TRAILERS

Operators of low bed trailers will do well to thoroughly investigate Rogers Trailers and make comparisons with others as to design, construction and operating features.

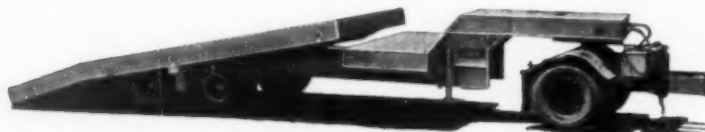
There are general purpose trailers for handling many types of loads. Others are especially suited for moving caterpillar mounted cranes. Another trails along behind a dump truck, doubling its usefulness. Tilt deck trailers handle certain jobs especially well, and pole trailers aid the conventional trailers in handling long loads, such as stacks, tanks, processing equipment.



We frankly believe that if you "Check You'll Choose A Rogers." Write for the new catalog.

ROGERS BROS. CORP. ALBION PENNA.

Export Office: 110 Church St., New York 7, N. Y., U. S. A. — Cable Address: Brosites



Divided bed, tilt deck trailer with gooseneck.

Huge Asphalt Tank

(Continued from page 101)

• **Launching.** The launching was to be done at low tide during the period of greatest tidal differences, and when the rising tide floated the tank it could be towed across the bay to the beaching site. The beaching site was prepared with logs secured at 15-ft. intervals to serve as rollers and to prevent the skid runners from digging too deep into the mud.

A check on the ability of the tank's bottom to withstand the forces of floating revealed a great weakness, and a stiffening grid of 4- by ½-in. plate on edge was welded egg-crate fashion to the bottom in 4-ft. squares. A tension brace resembling bicycle spokes was installed to help hold the tank in shape. Computations revealed that the tank should be very stable in an upright position of floating. With the metacentric height of the tank figured at more than 34 ft., it would draw 1.8 ft. of water plus the depth of the skid. (This figure proved to be exact.) The 10 days consumed in this job made us miss the first high tide. The launching was made only an hour after the lowest point of the tide. Six hours later it floated free of the bottom and was towed across the bay by a sea mule on one side and an LCM on the other.

• **Beaching.** The four 50-ft., 1½-in. towing cables were coiled and hung on hooks on the side of the tank so that they could be readily attached to the tractors waiting at the beaching area. After seeing 6 tractors laboring to move the tank along a level road, we made arrangements to have 8 tractors on hand to pull the tank up to dry land. To avoid putting excessive strain on the 50-ft. towing cables, the towlines from the second 4 tractors were led directly to towing shackles on the skids.

Four 150-ft. cables were used, and these were run between the tracks of the closer tractors.

While the sea mule held the tank slightly off-shore the long cables were worked onto the shackles, which were now 3 ft. under water. Then the tractors were all carefully aligned to avoid walking over any towlines.

Work got underway immediately to clean the interior and exterior of the tank and to make alterations to prepare it for use as an asphalt storage. Today, the tank holds the vast amount of asphalt formerly contained in about 160 transit tanks costing \$24 a month each in rental. The resultant saving to the Navy is more than \$3,800 a month.

... for more details circle 224, page 14

Concrete Subdrains

(Continued from page 93)

The lowest unit price bid on 8 in. perforated concrete pipe was \$.915 lin. ft., highest unit price bid was \$1.30 per lin. ft. Unit price bid by the lowest total bidder was \$1.05 per lin. ft.

The lowest unit price bid on 8 in. perforated corrugated metal pipe was \$1.39 per lin. ft., the highest \$2.00 per lin. ft.

The contract was awarded to the low bidder on concrete pipe, Van Doren and Stancil, Richmond, Va. Work was started on April 8, 1954, and completed in 35 working days. Total cost of construction:

Van Doren and Stancil	\$30,179.47
Engineering and	
Supervision	3,297.03
Manhole castings	
(furnished by city)	291.50

\$33,768.00

Plans and specifications were prepared by the department of public works. No Federal Airport Funds being available in that fiscal year, the entire cost of the work was borne by the city.

Upon completion of the subsurface drainage the taxiways were topped with 2½ in. of plant mix asphalt in 1954. Runway 6-24 was repaired with 3½ in. of plant mix on the center 150 ft., the outer 75 ft. on each side receiving a double surface treatment to seal the entire runway surface. Runway work was completed in 1955.

J. S. Sorensen, airport manager, reports that installation of the subsurface drainage system eliminated most of the pumping within the first year. It is anticipated that the few remaining areas where pumping action still exist will disappear in the near future, since the runway has been sealed.

LEROI NAMES BUTTNER MANAGER OF ENGINEERING. H. J. Buttner has been appointed manager of engineering for LeRoi Division of Westinghouse Air Brake Co., Milwaukee, Wis.

WORTHINGTON PROMOTES GRIFFIN. Ralph G. Griffin, heretofore assistant manager of the Cincinnati district office of Worthington Corporation, Harrison, N.J., has been made manager of the office.

HYSTER ANNOUNCES APPOINTMENTS. Daniel J. Sheehan, with the Hyster Co. since 1946 at the Danville, Ill. plant, has been appointed general parts and service manager with headquarters in Portland, Ore. James L. Woodley, with Hyster since 1945, has been made manager of the Danville, Ill. plant.

How a Seismic Survey located bedrock for the Massachusetts Turnpike

The Massachusetts Turnpike, a 123-mile 239-million superhighway scheduled for completion in November 1956, faced a tight time schedule. The Massachusetts Turnpike Authority, through Howard, Needles, Tammen & Bergendoff, the General Consulting Engineers, called upon Gahagan to help locate bedrock through a seismic survey. Gahagan crews began work on August 9, 1954, and finished on May 4, 1955. A total of 45,000 seismic instrument readings were taken. Combined with check borings at key spots, the seismic results enabled section engineers to construct over 1,400 cross-section profiles at 50-foot intervals. For highways, dams, power plants, bridges, etc., seismic surveys save time and money; provide a wealth of data on the subsurface. For full details write Kenneth Sandbach, Vice Pres., Geophysical Survey Division, Gahagan Corporation, 90 Broad St., New York 4, N.Y.

Gahagan has been a leader in the hydraulic dredging field for over fifty years

ANOTHER
GAHAGAN
CASE HISTORY

... for more details circle 247, page 14

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a complete line of Soil Sampling Tools, Diamond and Shot Core Drills,
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... for more details circle 177, page 14

UNIT MODEL 510

THE NEW UNIT *Challenger* ... with CLAMSHELL



It's BEST to INVEST in UNIT...

because UNIT's advanced design gives you Self-Aligning, Replaceable Hook Shoes... Straight-in-line Engine Mounting with Torque Converter... Hydraulic Actuated Clutches... Modern Transmission with Involute Splines... One Piece Cast Gear Case... Alloy Steels and Forgings... Force Feed Lubrication and many other UNIT advantages. These life-prolonging features are contributing substantially to the performance and efficiency of each machine. And they explain why UNIT equipment is so universally acceptable.

See the many other new features illustrated and described in UNIT CHALLENGER Bulletin C-800. Write for your copy of this bulletin.



UNIT CRANE & SHOVEL CORP.
6407 W. Burnham St. • Milwaukee 14, Wis., U.S.A.

Geared to boost your earnings!



A8302-7/PC

... for more details circle 235, page 14

Traffic Safety

Basic study of traffic accidents launched

A broad study of Ohio highway accidents, aimed at determining the basic causes of traffic mishaps, is under way in the Ohio State University Engineering Experiment Station. A seven-member team representing several university departments will work on the project, sponsored jointly by the Ohio Department of Highway Safety and the university.

Purpose of the year-long study is to provide facts on accidents not always apparent from existing reports. Possible value of such information was stressed recently by Director U. C. Felty of the Department of Highway Safety, who said that traffic accidents in Ohio alone now cost more than \$200 million per year.

Supervising the study will be Prof. Emmett H. Karrer of the civil engineering faculty, widely known authority on highway engineering.

Education of drivers through special campaigns such as the national "Safe Driving Day" and "MAPS" in Columbus are unquestionably beneficial in reducing accident tolls, Professor Karrer believes. He adds, however, that "officials responsible for the operation of our roads and streets are well aware that the basic problems lie far deeper."

The department of highway safety will provide preliminary information on accidents for the research. Two graduate students will collect data on specific accidents through interviews of persons involved. One will analyze physical condition, alignment, grade, curvature and other aspects of the highway. The other will analyze patterns of driver behavior.

Team for the project also will include four faculty members yet to be named. These will be a professor of mechanical engineering who will deal with mechanical failures in the automobile; a professor of civil engineering, familiar with elements of highway design and condition; a professor of psychology who will assist in matters of driver capability; and a professor of social administration who will be concerned with driver attitude.

"At first we will limit the study to one-car accidents in rural areas," Professor Karrer said, "in order to eliminate the problem of 'blaming the other driver'." Later, as results of the study warrant, researchers may take up road and street accidents in other areas involving more than one car.

HUBER-WARCO 5D-190 CUTS CONTRACTOR COSTS



Third 5D-190 In Service For Ohio Contractor

"The Huber-Warco 5D-190 allows us to make 15 more trips a day with our scrapers, than was formerly possible with other equipment," says Mr. Berlin Bruns, of Bruns Coal Company, a Zanesville, Ohio contractor.

This 5D-190, a 195 h.p. unit, is presently working on a four-mile stretch of new road on U. S. Route 50, southeast of Athens, Ohio. Approximately 287,000 yards of fill dirt is being moved to the job site, from a hill one and a half miles away.

The 5D-190 is constantly moving back and forth maintaining this one and a half mile stretch of road, keeping it clear for the four 20-yard scrapers, as they speed down from the top of the hill.

Mr. Bruns stated, "The 5D-190 works a 10 hour shift, six days a week, and has given us excellent service. Our operator reports, the perfect balance of weight and power, plus the torque con-

verter and power-shift transmission, handles a larger volume of work, with fewer passes, than he has experienced with any other grader previously used."

The Huber-Warco 5D-190 has many duties at the Athens job site, including grading of the fill, and towing a string of sheepfoot rollers which compact the fill.

The Bruns Coal Company owns two other Huber-Warco 5D-190 motor graders. One is in operation at Steubenville, Ohio, and the other at Monterey, Tennessee.

In addition to the 195 h.p., torque converter, full power-shift transmission, and power-sliding moldboard, the 32,000 pound Huber-Warco 5D-190 also features: tail shaft governor, four wheel brakes, hydraulically cab-controlled blade movement, mechanical steering with hydraulic booster, high axle clearance, 360° blade rotation, and many other important features.

For a Demonstration - See Your Nearest Huber-Warco Distributor



HUBER-WARCO COMPANY

MARION, OHIO, U. S. A.

Road Machinery

CABLE ADDRESS: HUBARCO

ROAD ROLLERS • MOTOR GRADERS • MAINTAINERS • GRINDERS

... for more details circle 206, page 14

ROADS AND STREETS, January, 1956

111

What's New in Equipment and Materials

Reader Service Coupon on Page 14



● The Drott Four-in-One operating as a clamshell takes a good 2½ yd. bite of loose earth and old tree roots.

Drott Announces 4-in-1 for International TD-14A

A Drott Four-in-One skid-shovel attachment for the International TD-14A tractor was recently demonstrated at the company's north woods proving grounds.

Acceptance by the contractors of this equipment for the TD-6 and TD-9 tractors indicated demand for a larger unit. As the name indicates, this versatile piece of equipment performs several functions.

Key to operation of the Four-in-One is the bucket control hydraulic cylinder located by the operator's seat. To change the operation it is necessary only for the operator to point the indicator rod to any one of four positions indicated on the cylinder. These positions and their allied functions follow:

● **Bulldozing, grading, spreading.** With the clam open the bottom of the bucket becomes the dozer blade, the back of the blade resting on the skid-shoes. Depth of cut is controlled by forward and backward pitch of the blade, rather than by the conventional raising and lowering of the blade. Pitching the blade forward increases the degree of cut, backward decreases the cut.

● **Bullclam shovel.** In this position the clam serves as a depth gauge. Various widths of openings permit the cutting edge to lower to a predetermined depth. As the unit moves forward material boils into the bucket leaving a smooth surface for the tractor to travel over. When loaded the clam is closed, the bucket tipped back on the skid-shoes and the load may be transported short distances.

● **Skid-shovel.** In this position the Four-in-One has the same action as the Drott skid-shovel. With the clam fully closed, straight ahead filling is accomplished by

tilting the bucket forward to excavate until filled to heaping, rolling the bucket back on the skid-shoes, and transporting the load largely on the shoes eliminating most of the strain on the front end of the tractor. Loading is accomplished by raising the load straight up hydraulically, tilting the bucket to dump forward, or by opening the bottom.

● **Clamshell.** By opening the bullclam wide it is possible to pick up loose material, or to operate as a clamshell on stockpiles. All operations are hydraulically controlled, rollback, transporting and loading are the same as skid-shovel operation.

The Four-in-One is well adapted for use as a backhoe, for grabbing and loading stumps, backfilling, and bank-loading. It also does an excellent job of pushing down fairly large trees and removing them from rights-of-way.

The equipment is exceptionally well constructed and has many fine features. Capacity of the bucket is 2½ yd.

One of the outstanding features of this unit is the Hydro-Spring, a Drott exclusive. This device is a hydraulic cylinder enclosed in a heavy coil spring, incorporated into the system supplying oil to the lifting side of the main lift cylinders. Any shock force opposing the force of the hydraulic system tends to displace oil from the lift cylinders. This displaced oil is channeled to the Hydro-Spring, extending the cylinder and compressing the coil spring. This action cushions the shock — the released spring returning the cylinder to its normal position. Measured effect of the Hydro-Spring indicates a reduction of more than two-thirds of these shocks, materially increasing the life of the hydraulic system, loader, and tractor. Operators report a decided re-

duction in fatigue.

Delivery of the new units is scheduled for around the first of March, 1956.

Detailed information on this and other equipment may be obtained from Drott Manufacturing Co., Milwaukee 8, Wis.

For more information circle 108 on Service Coupon Page 14 and mail now.

Convertible Transit Level

A completely redesigned optical system with 3-ft. short focus for close-quarters surveying, highlights the features of the new model builders' convertible transit-level introduced by C. L. Berger & Sons, Inc., Williams St., Boston 19, Mass.

An internal-focusing 10½ in. telescope with 22-power coated optics views object right side up, produces a clear, sharp image even in poor lighting over long sights as well as at close distances.

Accurate leveling is assured by providing a plate level vial in addition to the sensitive telescope vial. The forged brass horizontal circle and the vertical arc have double verniers reading to five minutes.

Leveling, clamp and tangent screws are fully dust protected. The instrument can be converted from a transit to a level with ease and speed and stays in adjustment at all positions by means of a positive locking device. Brass and bronze construction assures extreme durability, even under adverse climatic conditions.



Berger Convertible Transit-Level

For more information circle 109 on Service Coupon Page 14 and mail now.

Form Coating

A new coating scientifically developed specifically for use on steel or wood concrete forms has been placed on the market by Stonehard Co., Depart. RS, 1306 Spring Garden St., Philadelphia 23, Pa. It is claimed this coating: Lengthens the life of all forms; cuts cost of form maintenance; is not all soaked up; remains on surface where needed; provides dark, visible protection; prevents damage to pourings and produces easier stripping. In addition it is claimed the repeated coatings are unnecessary.

For more information circle 110 on Service Coupon Page 14 and mail now.

Crushing Plant Features Screen Ahead of Jaw Crusher

A new portable crushing and screening plant designed for use in the intermediate crushing stage of gravel and rock has been added to the line of crushing plants manufactured by Pioneer Engineering Works, Inc., Minneapolis 13, Minn., subsidiary of Poor & Co., Chicago.



Model 120 JS Crushing and Screening Plant

A high degree of adaptability to varying operating conditions is obtainable for this new, field-tested plant, designated the 120 JS. When used between a primary and a secondary, it permits either feeding of larger material to the primary or increasing production by means of smaller stages. The plant also has possibilities for use as a primary in itself, with a portable apron feeder or a portable feeder conveyor, where pit-run is suitable.

The plant consists of a 4-ft. x 8-ft. 2-deck Mesabi-type vibrating screen mounted ahead of a 2036 jaw crusher, with two delivery conveyors. Provision is made to convert the 2036 jaw crusher into the 1536 size by use of a 5 in. spacer (an optional item) which permits smaller settings of the jaw opening; or, the plant may be purchased with the 1536 jaw crusher, as such, installed as optional original equipment.

For more information circle 111 on Service Coupon Page 14 and mail now.

Bituminous Plant Has Greater Adaptability.

A redesigned field-tested version of its Model 102 continuous mix bituminous plant, featuring still greater adaptability to varied types of jobs, has been announced by Pioneer Engineering Works, Inc., Minneapolis 13, Miss., subsidiary of Poor & Co., Chicago.

Main factor contributing to the increased adaptability is a 4 compartment bin which allows greater latitude of, and flexibility in, composition of aggregate

fed to the mixer. On jobs where less than four sizes of aggregate are sufficient, the 4 compartment bin can easily be converted to production of whatever fewer sizes can be attained by combining compartments.

Production capacity of the Model 102 continuous process plant ranges up to 200 tons per hour, depending on material conditions. It has only two main units — a combination drier-dust collector and a combination gradation-mixer — each compactly assembled in a straight line on a single chassis.

Standard auxiliary units include a cold aggregate feeder, a hydraulic cradle-mounted conveyor which delivers aggregate to the drier, a bucket elevator which transfers material from the drier to the gradation mixing unit, a truck-mounted combustion chamber, and a diesel generator set.

For more information circle 112 on Service Coupon Page 14 and mail now.

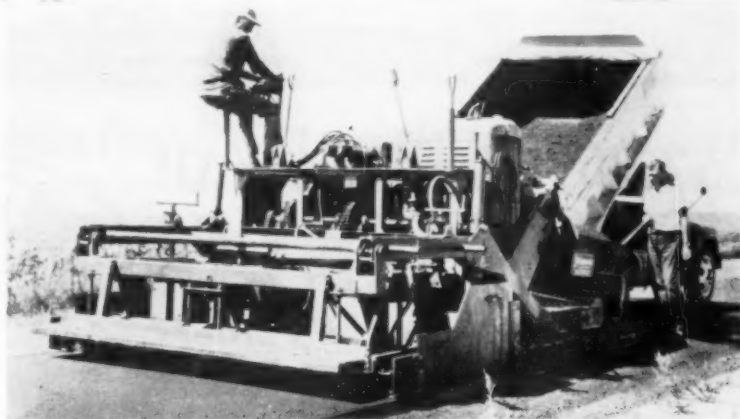
Radical Improvements Mark New Paver

The bituminous paving unit here shown was developed from two years of concentrated design effort, shop work, and field testing. The engineers responsible for it

nance and repair costs, and a road finish of maximum riding quality. Preliminary to the actual development was a series of field studies to determine as closely as possible just what was wanted by construction men and highway engineers in a machine of this character.

Pioneer Engineering Works, Inc., of Minneapolis, a subsidiary of Poor & Company, Chicago, is the producer.

Features of this paver, designated the "VIBROmatic," include — oscillating screed, consisting of a toothed strike-off bar and precompactor, which meters out the material as required across the full width and for any needed mat thickness; a high-speed, fully heated, vibrating compactor, which irons out the mat surface to a uniform density; simple screw adjustment on each side for control of mat thickness up to a depth of 10 in. (field tests have shown that after initial adjustment has been made, only infrequent setting of the depth screws is necessary, even though the machine is traveling on an uneven base); crawler tracks long enough (84 in. on ground) to bridge ordinary irregularities in base course; a simple screw controlling crown setting of both screed and compactor through a mechanical interlock, to give a crown adjustment from $\frac{1}{2}$ in. negative to 2% in.



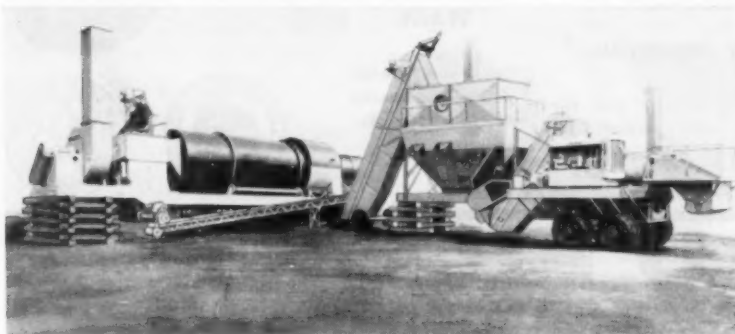
Pioneer's new Bituminous Spreader and Finisher — the "VIBROmatic"

consider that it meets the objectives with which they started — a machine giving controlled compaction and uniform density of mat from any reasonable mix, a lay down rate exceeding all previous standards, ease of operation, low maintenance

positive while machine is operating; $\frac{4}{5}$ yd. hopper, which handles 10-ton loads and can be extended for more direct visibility of all phases of paving operation from operator's position on either side; easy maneuverability (at end of a run the paving action is lifted hydraulically into traveling position, and machine moves to next starting point at a speed up to 2.64 mph forward or 1.14 mph reverse); quick detachability of paving section from tractor, there being no mechanical drives between the two fingertip control, insuring accurate, easy steering whether paving or traveling.

Performance claims include the laying of a $\frac{1}{2}$ -in. mat 12 ft. wide at a rate of 66 ft. per minute without tearing or pulling, (a 2-in. mat at the same speed has been demonstrated as possible) and an over-all rate of from 250 to 300 tons per hour.

For more information circle 113 on Service Coupon Page 14 and mail now.



Pioneer Redesigned Model 102 Continuous Mix Bituminous Plant



Pettibone New York Corporation Speed Grader

Motor Grader

A new Speed Grader, built by Pettibone New York Corporation, is claimed to have so much reserve power that you could swing full moldboard loads of 360° without stalling or jamming of the circle controls. It is further stated that this power is so accurately controlled by the Speed Grader's full hydraulic control that inch-by-inch precision movement is easily accomplished and, even under poor tractive conditions, Pettibone full hydraulic control does a perfect job. The frame is of the strongest construction and is mounted on the heaviest tandems available.

Write now for full information to Pettibone New York Corporation, Dept. 36, Rome, N. Y.

For more information circle 114 on Service Coupon Page 14 and mail now.

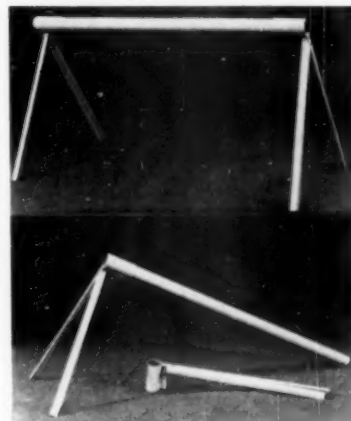
Safety Barricade Portable And Collapsible

A safety barricade, claimed to feature unusual lightness, portability and ease of assembly, has been introduced by Eastern Metals of Elmera, Inc., Dept. 43, Elmira, N. Y., under the name of "E-Z Barricade." Two folding "A" ends and a steel tubing cross-bar between form the entire unit, which can be dis-

assembled or assembled in seconds by means of two thumb screws. When assembled, the "A" ends are held open positively by a patented locking device, the E-Z Lok. Once locked in position, the barricade cannot be blown or kicked over.

Two models are offered — Regular and Super. The regular model has an over-all height of 36 in. and the super model has an overall height of 42 in., both measured when open. Cross bars in 4 ft., 5 ft., 6 ft., 8 ft., and 10 ft. lengths are interchangeable between models.

For more information circle 115 on Service Coupon Page 14 and mail now.



"E-Z Barricade"

52,000 Tires Worth Of EXPERIENCE!

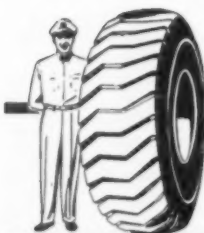
... Plus The World's Finest Retreading Facilities

Superior equipment, including the world's largest and finest three-sectional retreading mold, enables Southern Tire Company to retread any tire, regardless of growth, without buffing to the breaker strips or damaging the carcass of the tire in any way!

This, plus Southern Tire's long experience and use of the finest rubber made, assures **GUARANTEED NEW TIRE MILEAGE AT HALF THE COST!**

NO EQUIPMENT DOWNTIME

Southern Tire's pick up and delivery service—at your job site after work hours—assures no equipment downtime.



CHOICE OF ROCK SERVICE, TRACTION TYPES, OR RIB TREADS TO SUIT YOUR PARTICULAR JOB.

All Sizes from 1100x24 to 2700x33.

Also new sizes 29.5x25 and 29.5x29.

Call Your Favorite Dealer and Specify Southern Tire Retreads.



SOUTHERN TIRE COMPANY

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FLORENCE, ALA.

PHONE
COLLECT
Florence
85 or 86

Sectional Explosives Tamping Pole

Lightness, strength, and flexibility have been combined in a sectional explosives tamping pole manufactured by Ideal Explosives Supply Co., 95 Craggy Ave., Asheville, N. C. The 10-ft. pole sections are easily joined to form a tamping pole adaptable to any depth hole, eliminating the necessity for excessively long, hard-to-handle poles. Excellent for tamping explosives in either horizontal or vertical holes, the sections may be joined, by means of special slotted log-chain joints, during insertion and dis-



Log Chain Joint of Sectional Tamping Pole

connected as they are withdrawn. Pole sections, 1½-in. in diameter, are hemlock Douglas fir with joints of non-sparking magnesium-bronze. Any size wooden tamping plug may be attached to the end of the pole. The sectional tamping pole has been used successfully to depths of 120-ft. and on quarry, construction and river crossing jobs. One plug of any desired size is furnished with each set of poles. In the illustration log-chain joint of sectional tamping pole is demonstrated by pole sections shortened for demonstration purposes.

For more information circle 116 on Service Coupon Page 14 and mail now.

Aluminum Over-Road Sign

A new sign span is being produced by Pfaff & Kendall, 84 Kendall St., Newark, N. J. in which a new type of aluminum fabrication developed by the company is being used. Supporting shafts are seamless, tapered all aluminum, with the span



Sign Installation on Michigan Highway

all welded of individual sections. The unit illustrated is 48 ft. and has been tested under loadings of 60-lb. per running foot and 105 mph wind loads.

For more information circle 117 on Service Coupon Page 14 and mail now.

6½ Ton Rock Ripper

An extra heavy-duty ripper, developed specifically for Caterpillar D9 tractors, has been announced by American Tractor Equipment Corporation, 9131 San Leandro Blvd., Oakland 3, Calif. Weigh-

ing over 6½ tons, the ATECO HRD9 rock ripper is built to make maximum use of the D9's increased power and weight to handle heretofore "un-rippable" materials.

Massive curved ripper shanks equipped with replaceable rock-splitting points are stated to produce an underground "quivering" action that seeks out cracks and weak spots, then shatters rock to easy loading condition. Weight of tractor plus ripper is applied to points by positive hydraulic control for fast penetration in hardest materials. Depth-adjustable shanks are mounted on trailing swivel brackets which pivot on turns for effortless steering.

Maximum ripping depth is 26 in. with standard ripper shank, 30 in. and up with special shank. Subsoiler shanks for 32 in.,

36 in. or 48 in. subsoiling depths and special root knives for land clearing and tree felling, are also available.



Ateco's New Ripper

For more information circle 118 on Service Coupon Page 14 and mail now.

SWENSON SPREADERS FOR ICE CONTROL

SPREADS SALT 200 LBS. PER MILE OR IN ANY DESIRED AMOUNT

Lays a Narrow Strip or Full Traffic Lane

Handles all granular materials — salt, cinders, sand, calcium chloride, rock chips. Spreads at speeds up to 30 M.P.H. Clutch-controlled flow: steady or intermittent for hills and intersections.

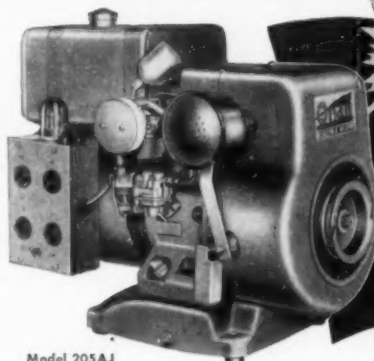
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SWENSON SPREADER & MFG. CO.
LINDENWOOD, ILLINOIS



... for more details circle 230, page 14

More Power, Lighter Weight, More Compact Powered by dependable 4-cycle engines



Model 205AJ
2,500 watts A.C.

New
ONAN
Portable
ELECTRIC PLANTS

Put more power on the job!

These new power-packed electric plants are smaller ... lighter ... easier to take along and move around. Model 205AJ shown here weighs only 154 pounds ... yet it develops 2,500 watts A.C.

Multiple receptacles allow direct plug-in of several floodlights or heavy-duty electric tools, supplying a whole crew with labor-saving electric power.

These new plants are completely Onan-built with Onan engines direct-connected to Onan generators for trouble-free long life. Carrying frames and two-wheel dollies are optional equipment.

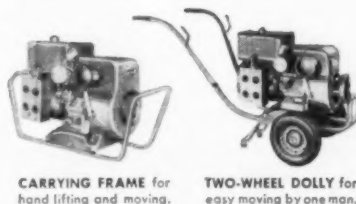
Onan Portable Electric Plants: 500 to 5,000 watts.

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D. W. ONAN & SONS INC.

3768 University Avenue S. E., Minneapolis 14, Minnesota

... for more details circle 217, page 14



CARRYING FRAME for hand lifting and moving.

TWO-WHEEL DOLLY for easy moving by one man.



Rubber-Cushioned Tire Chains

A rubber-cushioned tire chain featuring snap-on, snap-off cross chains, — has been announced by the Thomas Co. Minneapolis, 7, Minn. Called the Rugo tire chain, the rubber-cushioned, double-traction, triple-wearing tire chain fits any heavy duty vehicle. The chains feature an exclusive rubber roller assembly. The rubber roller acts as a cushion for the chain, prevents damage to the tire, and holds the cross chain on the hook. Resiliency of the rubber roller permits easy removal of the cross chain, even when on the tire.



Rugo Tire Chain

For more information circle 119 on Service Coupon Page 14 and mail now.

Traffic Signal Identifications By Pulsing Red Light

A new concept of traffic signal identification, a rapidly pulsing red light, has been offered by Southern Signals, Inc., 222 Beach St., Shreveport, La., as a possible solution to the increasing number of automobile accidents caused by drivers not seeing traffic signals. The new identification, "Pulsating Red," operates on a fourth section set above the red indication on a standard traffic signal, or directly to the red indication itself. The rapid pulsing of the light, 340-420-pulses per minute, catches the drivers eyes from greater distances thus preparing him much sooner to take the necessary action to stop safely. Actual installation tests have proved that "Pulsating Red" stands out effectively against a distracting background of electric signs and is not affected or washed-out by the sun.

For more information circle 120 on Service Coupon Page 14 and mail now.

Lightweight Concrete Vibrator

A new lightweight concrete vibrator, Model BGW, placed on the market by Stow Manufacturing Co., 443 State St., Binghamton, N. Y. has a 2 hp., 4-cycle air-cooled gasoline engine and runs at speeds from 6,000 to 9,300 vibrations per minute.

This new vibrator has a newly designed lightweight low-cost 1½ in. vibrator head that weighs only 5 lb. 7 oz., and has tremendous centrifugal force. This

head has duplex ball bearings at each end and seals that seal the lubricant in for life. It has a hardened steel low cost removable tip which means that the tip can be replaced after long wear without having to replace the complete head. A



Model BGW Vibrator


rubber tip for use where plywood forms are used can be substituted for the steel tip if desired.

This lightweight head is very easy for the operator to move around in the concrete mass. A 2 in. head is available.

For more information circle 121 on Service Coupon Page 14 and mail now.

FRINK V-TYPE SNO-PLOWS

WILL DO THE JOB BETTER!



BECAUSE they are Self-Ballasting. Frink V-Type Sno-Plows are suspended from the truck attachment by two Heel Adjusting Chains. The weight of snow on the moldboard ahead of this suspension point creates a downward pressure.

BECAUSE there is No Side Thrust. Snow is raised above the level of the adjoining snow on the inclined forward portion of the moldboard, thus eliminating side thrust caused by the snow packing into this adjoining snow.

BECAUSE they Push Easier. The cutting edge and the front of the moldboard have sufficient shear to keep the snow moving. Also, the Riser board raises the snow before carrying it to the sides, thus requiring less pushing power.

BECAUSE they Bevel Side Banks. Frink V-Type Sno-Plows are wider at the tips than at the cutting edges. This bevels the side banks which discourages drifting and prevents snow from falling back into the road.

For further information on this Sno-Plow write for catalog to Clayton, N. Y., Box RS581



FRINK SNO-PLOWS, INC., CLAYTON, NEW YORK
Made in Canada by
FRINK SNO-PLOWS of CANADA, LTD., TORONTO, ONT.

... for more details circle 196, page 14

Repair Link for Chains

A twin-pin connecting link, announced by Page Engineering Co., Clearing P. O., Chicago 38, Ill. is designed to provide fast and strong chain repairs. It can be installed with a hammer within five minutes time. This repair unit is also used as a means of joining the load line to the hitch plate extension and, in larger buckets, as a connection to the trunnion link. Formed of two inter-locking and identical halves, each half is inserted through the ends of the two sections of chain to be jointed together. The link is then slipped together into its locking position and two oval pins are driven into place. A U-shaped key pin is then inserted into the oval pins which holds them securely in place. The open ends of the U-pin are then hammered or clinched together, thus forming an unbreakable repair link.



Repairing Chain with Twin Pin Link

For more information circle 122 on Service Coupon Page 14 and mail now.

Chain Saw: 5 HP; 20 lb. Weight

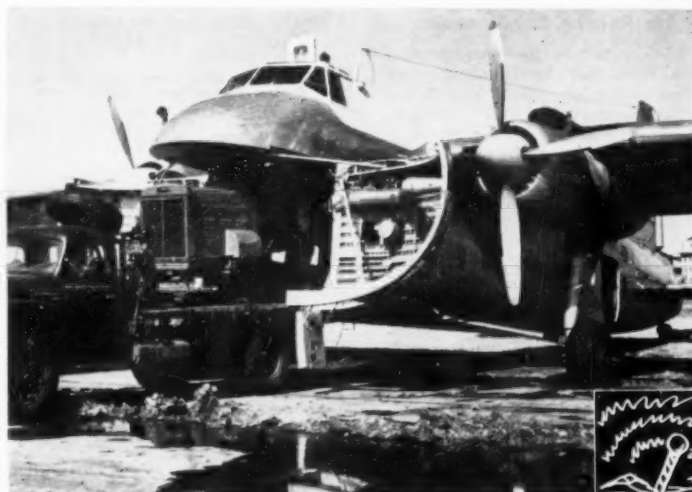
A new Model 5-20 chain saw, announced by Homelite, division of Textron American Inc., Port Chester, N. Y. delivers a full 5 HP, yet weighs only 20 lb. Because of its all-angle, diaphragm carburetor and its light and perfectly balanced weight, the saw is extremely easy to handle — cuts in any position — up, down and upside down; on all types of cuts — felling, bucking, boring, notching, trimming, or undercutting. It is claimed to slice through 20 in. trees in



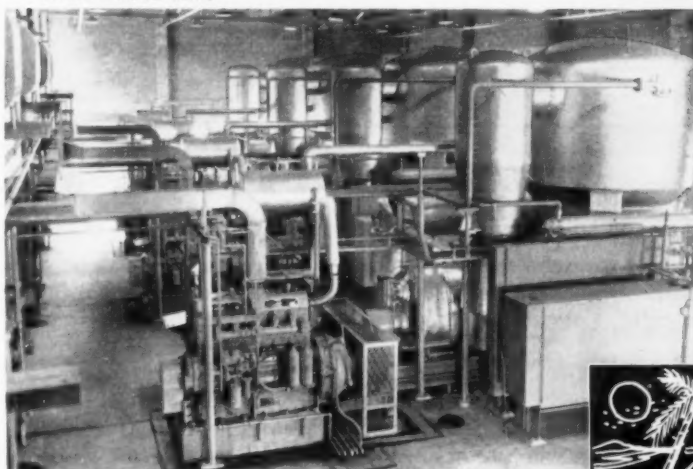
Homelite Model 5-20 Chain Saw

20 seconds and to bring down timber up to 6 ft. in diameter. With a low-cost clearing attachment, the Model 5-20 becomes a fast-cutting tool for clearing highway, pipeline and power line rights

from the Canadian Arctic to Saudi Arabia



CANADA—150 hp Waukesha Diesels about to take off for service in the far north.



SAUDI ARABIA, Dhahran Air Base—Four 250 continuous hp Waukesha Diesels power Cleaver-Brooks distillation units producing 200,000 gal. of potable water daily.



Power packed, fast, smooth—with built-in stamina for service in any country or climate—Normal or Turbo-diesels, Gas, or Gasoline Engines—up to 1135 hp. Waukesha Motor Company, Waukesha, Wis., New York, Tulsa, Los Angeles. Send for Bulletin 1079.

WAUKESHA

Diesels

290-R

... for more details circle 237, page 14

117

of way. A new brushcutter attachment quickly converts the Model 5-20 into a safe, easy-to-operate power scythe that cleans out brambles, brush, undergrowth and small saplings 6 times faster than hand methods!

For more information circle 123 on Service Coupon Page 14 and mail now.

Portable Rotary Compressor

An all-new portable rotary compressor, the Blue Brute 600', has been placed on the construction equipment market by the Compressor and Tool Division, Worthington Corporation, Harrison, N. J.

The Blue Brute 600' Compressor is a modernized unit with streamlined styling



Blue Brute 600' Compressor

and new design and engineering features. It employs the most up-to-date engineering principles. A new easy-acting clutch allows operators to warm-up the engine before cutting in the compressor. The fully draining compressor is stated to

eliminate settling of oil and moisture in any low areas of either cylinders, inter-stage chamber or discharge point. The new Blue Brute's unique cylinder arrangement gravity-drains all oil and moisture during shutdowns.

Additional features of the 600' compressor include two-stage oil separator, separate oil reservoir and air tanks and a shorter wheel base for easier handling on the job.

For more information circle 124 on Service Coupon Page 14 and mail now.

Binder for Patching Concrete Runways

Surco, a new latex-type binder for patching concrete runways has been placed on the market by Overseas Division, Allied Companies, 15 Peachtree Place, N. W., Atlanta, Ga. It is claimed the patches adhere tightly to the old concrete, are watertight and resist the action of oil, gasoline and glycol.

Damaged areas are first cleaned by picks, pneumatic tools, or sandblasting. Surco Yellow Label Concentrate, mixed with portland cement, and water is then applied in a coating as little as 1/4 in. thick. Pneumatic application is used for large areas; simple trowelling is most economical for small patches. Surco Concentrate consists of synthetic latex and additives that make it compatible with various cementitious materials.

For more information circle 125 on Service Coupon Page 14 and mail now.

Cultivating and Aerating Machine

For grass-divided parkway-type highways and recreational grounds, a new lift-type cultivating and aerating machine designed to fit Ford-Ferguson, International 300 and other makes of 3-point suspension hydraulic lift tractors has been announced by Soilaire Industries, Minneapolis 3, Minn. Named Trac-Lift,



Trac-Lift

the machine has eight sub-soil cultivating wheels with three different knives and tines to renovate, slice and core the root zone of turf for the purpose of conserving moisture and increasing growth. It is 6-ft. in width.

Transportation is met by the hydraulic lift so that a tractor and one operator can handle large areas of scattered turf.

For more information circle 126 on Service Coupon Page 14 and mail now.

WHAT ABOUT YOU, MR. READER?

Are you still active in the field? Have you moved or changed your position?

Unless you send this information directly to us we can't be sure. Sometimes a reader's name is cut from the mailing list because we are not sure that our information as to name, title and address is right. *Your* name might be cut from the mailing list.

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ROADS AND STREETS

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"I'VE BEEN MOVING DIRT SINCE 1936 AND TRIED ABOUT ALL KINDS OF EQUIPMENT. I'VE FOUND THAT **CAT*** EQUIPMENT ALWAYS COULD GO WHERE OTHER MOTOR GRADERS AND TRACTORS COULDN'T—AND STAYED ON THE JOB DAY AFTER DAY WITH PRACTICALLY NO ATTENTION EXCEPT FOR GREASING."

A. H. HOUSE, Superintendent
for M. E. Ruby, Jr., Austin, Texas



Mr. House, like all construction superintendents, rates his machines by *results*. He's getting them from the Caterpillar No. 12 Motor Grader shown helping build a farm-to-market road near La Grange, Texas.

The big yellow unit is maintaining a haul road for the fast-stepping DW15s and Scrapers. Result: the wheeled rigs are hauling 14 yards per trip on a 2½-mile haul in 12 minutes, including loading and dumping!

The No. 12 is wringing the last cent of economy out of the tractor-scraper teams on the job—helping them haul maximum capacity at the highest possible speed. Tomorrow this rig can be leveling, grading, shaping embankment or sloping fill.

And now the No. 12 can do all its many construction chores *even better*. For it is the first motor grader to be equipped with the exclusive Caterpillar

oil clutch. Now disc replacement is practically eliminated and maintenance is greatly reduced. Clutch fade, even under extreme operating conditions, is practically eliminated since the oil bath prevents the plates from heating.

Your Caterpillar Dealer would like to demonstrate these new motor graders on *your* job. Seeing them in action you'll understand how these versatile machines now can give you even more work at lower cost.

Caterpillar Tractor Co., Peoria, Illinois, U.S.A.

CATERPILLAR*

*Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

**99% OF ALL
CAT MOTOR GRADERS
ARE STILL IN USE**

JUST OFF THE PRESS

Technical Glossary Glosario Técnico

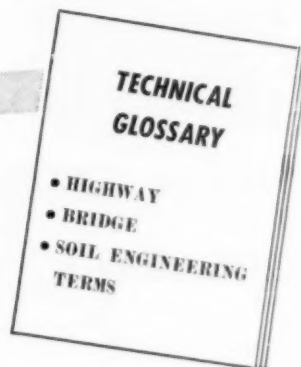
An authoritative book written by the U. S. Bureau of
Public Roads on Bridge, Highway, Construction, and
Soils Engineering Terms

Authoritative Background Given Below



Here is a book you will want:

- ★ 20,000 English-Spanish
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Public Roads
- ★ Preparation Cost in Excess of \$45,000



TECHNICAL GLOSSARY is a much needed work for use in translating English technical material into Spanish, or Spanish technical material into English, in order to convey the exact same idea and meaning to the reader of either language.

THIS BOOK was in process of preparation for a period of fifteen years. The preparation cost was in excess of \$45,000.

The need of a specific glossary or dictionary of terms of this type has long been felt. After several International conferences between representatives of the U. S. Bureau of Public Roads and Latin American engi-

neers, a decision was reached to prepare such a glossary. To further extend its usefulness, soil stabilization and associated laboratory work was included.

The manuscript for this book of over 35,000 terms was over 15 years in preparation under E. W. James, then Chief, Inter-American Regional Office, U. S. Bureau of Public Roads, working with the Library of Congress of the United States. It has been approved by a committee of five bilingual engineers of the Mexican government under the chairmanship of Sr. Ing. J. Fco. Rodriguez Cabo. It was then submitted to and approved by the "Academia Mexicana Correspondiente de la Academia Real Española" under the chairmanship of Sr. Don Martin Luis Guzmán, distinguished author, editor and publicist, also publisher of "El Tiempo."

It was then submitted to the V Pan American Highway Congress where a resolution was adopted commending the venture and recommending that the manuscript be published.

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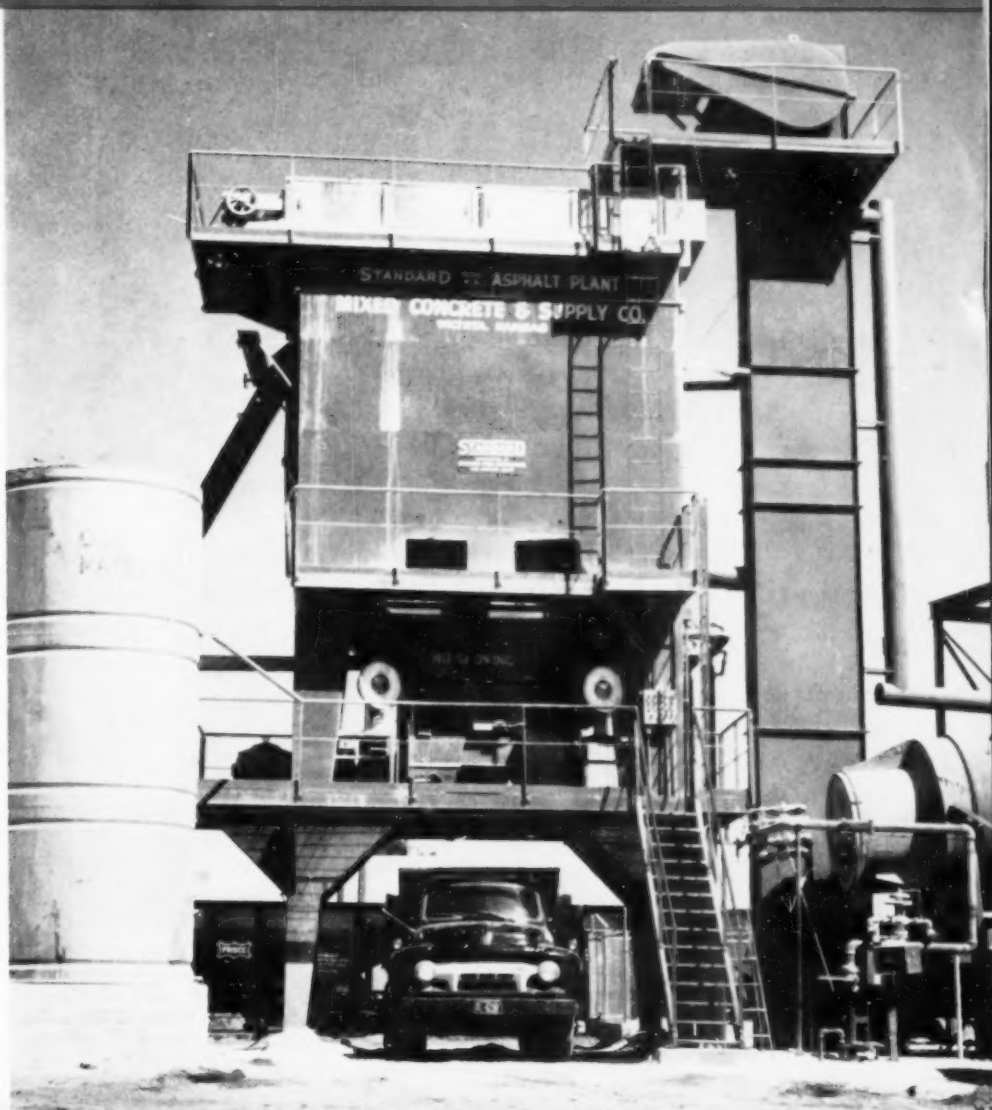
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Bituminous

ROADS AND STREETS



New hot-mix plant for Wichita contracting firm of Ritchie Bros. This is a Standard Steel plant with Hardy automatic controls and Defecto scales.



Published by Gillette Publishing Company
22 West Maple Street, Chicago 10, Illinois

In This Issue

**Needed Research in Asphaltic Road
Materials—By E. F. Kelley**

Only a
VIBROmatic®
can create pavements
like this

● Here you see a bituminous mat that is so smooth, so compact, so uniformly dense, and with so few voids that it exceeds highway specifications with "miles" to spare.

Pavements like this have been made possible through Pioneer's development of the *vibromatic* principle by which an oscillating screed and vibrating compactor work in conjunction.

The VIBROmatic oscillating screed is actually a toothed strike-off bar which meters out the material and precompacts it, filling in voids across the entire width of the mat.

The job is finished by the heated compactor, vibrating at 2000 cpm, which leaves a smooth-finished mat of uniformly high density throughout its entire width and depth.



**Other features which help make the new
PIONEER VIBROmatic the Paver of the Future:**

**OPERATING SPEED
AND CAPACITY**

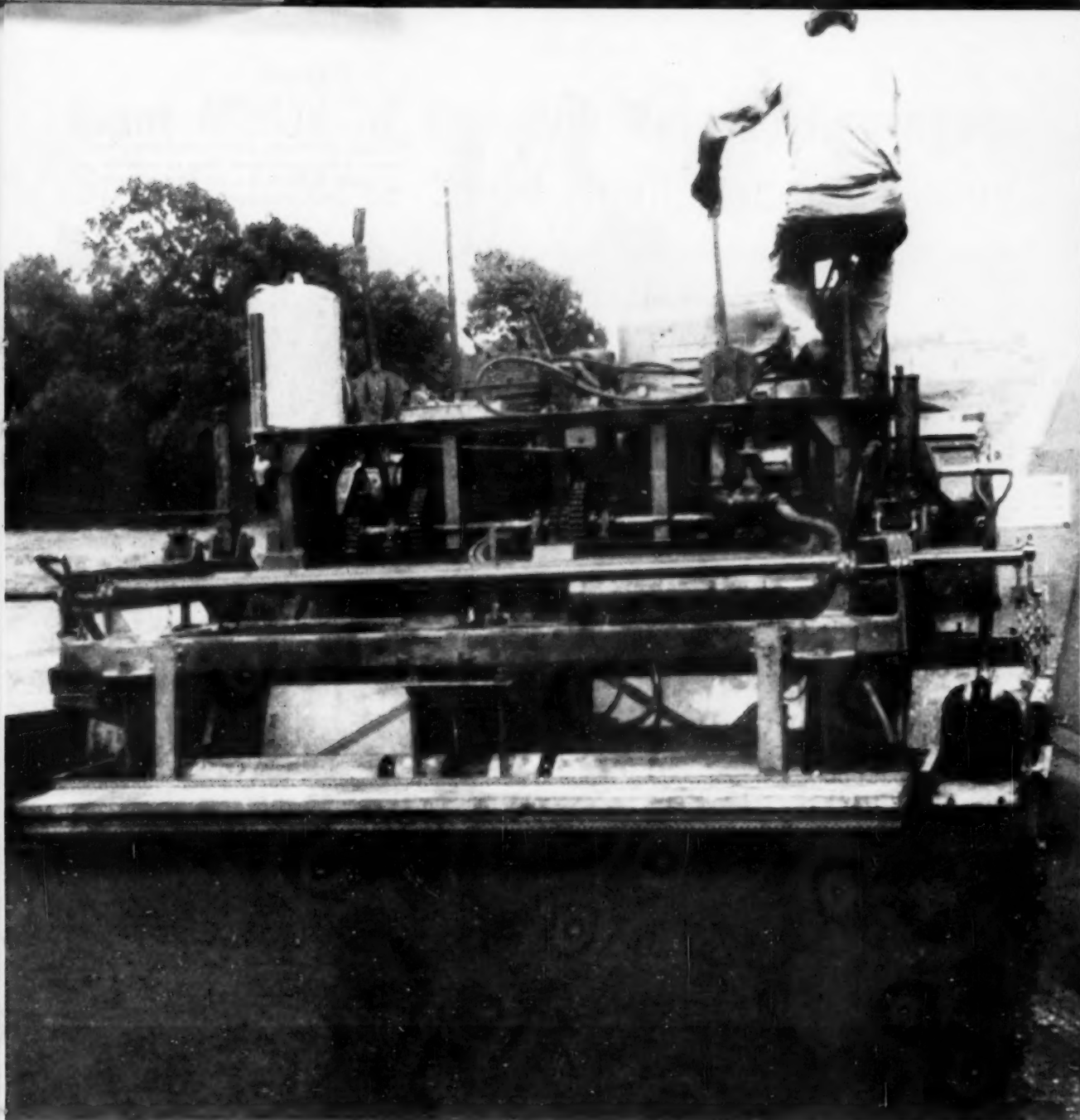
The VIBROmatic has abundant reserve power and 7 operating speeds. It has laid smoother, better quality 12' mats, 2" thick, at 66' per minute than conventional pavers can lay at half the speed. Furthermore, the VIBROmatic Paver can travel at speeds up to 2.65 mph.

**LESS MANPOWER...
LESS ROLLING**

Because of the VIBROmatic's unusual ability to lay straight edges at all speeds, it calls for less handwork for raking, edging, patching, etc. Better initial compaction and fewer voids require less rolling. Job reports say one full pass of the light roller is often eliminated.

**DEPTH AND CROWN
ADJUSTMENT WHILE MOVING**

Two screws control setting of depth adjustment through positioning of oscillating screed. Infrequent readjustment required even on comparatively rough subgrade. Crown can be quickly and accurately adjusted from 1/2" negative to 2 1/2" positive while paver is operating.



MAINTENANCE IS GREATLY SIMPLIFIED

Simple design greatly reduces time needed for lubrication and other preventive maintenance. Special attention has been given to accessibility and easy removal of wearing parts. Simplicity of extension and cut-off attachment design permits quick, snappy installation and removal.

... for more details circle 220, page 14

EASY-TO-OPERATE CONTROLS FOR OPERATOR COMFORT

Finger and toe-tip hydraulic controls of feeding and steering cut operator fatigue and easily make the VIBRO-matic the easiest-to-operate paver on the market. Operator has complete visibility of entire hopper, screw, screed, mat, and the pointer on the line being laid.

Copyright 1955 Pioneer Engineering Works, Inc.

These are only a few of the outstanding features of the revolutionary new VIBROmatic... the Paver of the Future. For further information, write or call Pioneer Engineering Works, Inc., Minneapolis, Minnesota (subsidiary of Poor & Co., Chicago) or your nearest PIONEER Distributor.

Pioneer
VIBROmatic[®]
BITUMINOUS PAVER

Only a
VIBROmatic®
can create pavements
like this

● Here you see a bituminous mat that is so smooth, so compact, so uniformly dense, and with so few voids that it exceeds highway specifications with "miles" to spare.

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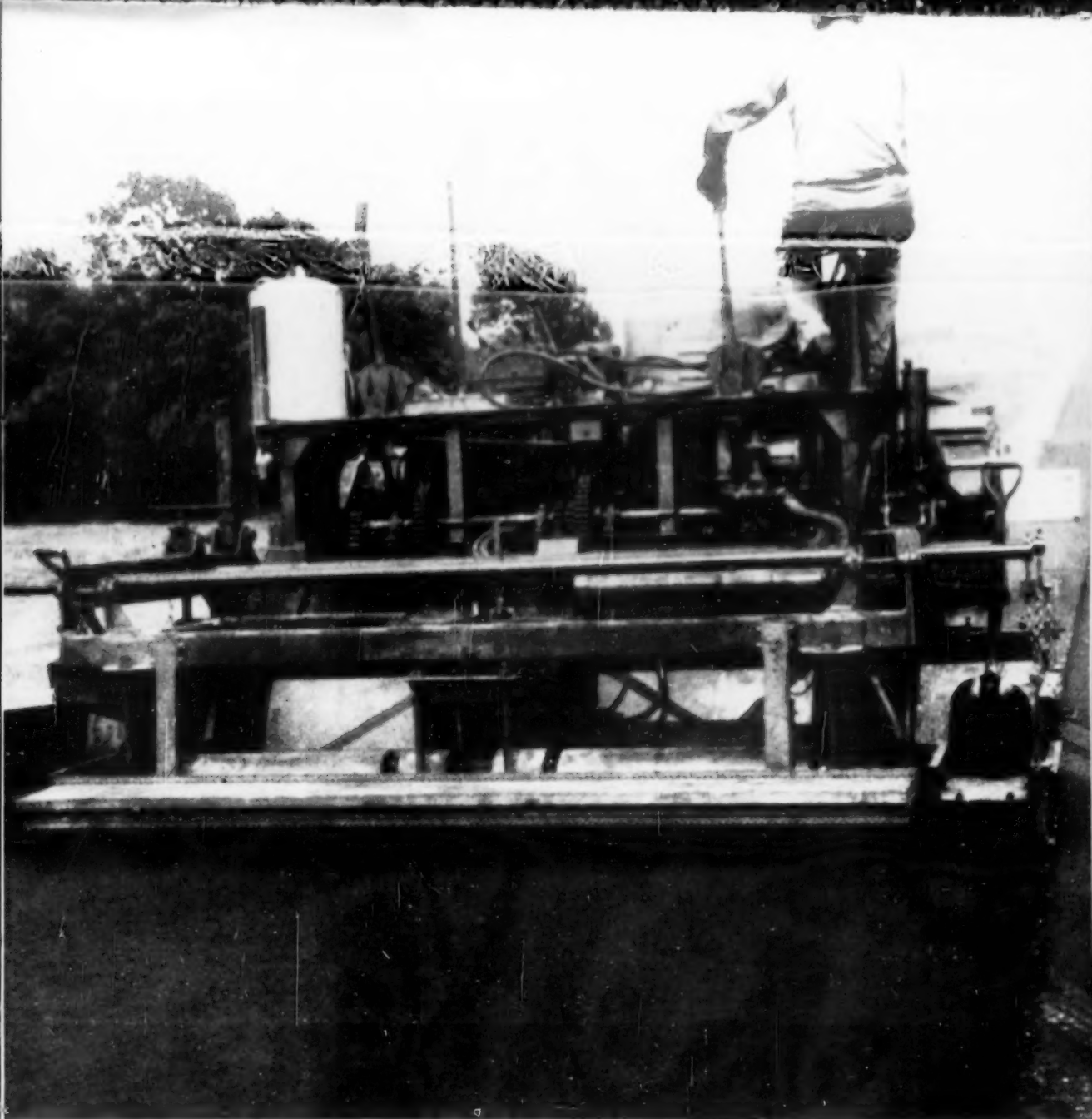
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ASPHALT PAVING EQUIPMENT



. . . for more details circle 183, page 14

ROADS AND STREETS, January, 1956

Plant Mixing of Bitumuls Retread Aggregate Speeds Indiana State Road Reconditioning



A MODERN TRAVEL-PLANT CONTINUOUS MIXER lays down a perfect carpet of Bitumuls Retread mix.



A THREE-WHEEL ROLLER compacts the Bitumuls Retread to final thickness.



TO PROVIDE A FINAL ARMORCOAT SEAL, the Retread surface is given an application of $\frac{3}{4}$ " to #8 stone chips.



HALF-WIDTH APPLICATION OF STONE CHIPS on completed full width application of Bitumuls Retread.

EMULSIFIED ASPHALT RETREAD construction is completed without closing roads to traffic, when plant-premixed Bitumuls Retread Aggregate is fed to the job in controlled amounts. Laying of loose stone ahead of the actual job location is thus eliminated.

Over any existing sound but worn or uneven pavement, a two-inch emulsified asphalt premix binder course is laid. Normally such a binder course is of open texture. A final application of keystone $\frac{1}{2}$ " to #8 is spread just prior to rolling operations. This provides additional stability so the new pavement can be quickly opened to traffic.

"Versatile, Low-Cost" Say Indiana Engineers
Bitumuls Retread is suitable for resurfacing or new construction. In combination with Bitumuls Penetration, or used alone, it has wide application in reconditioning roads retaining a reasonably sound base. Indiana engineers,

made wide use of Bitumuls Retread on their highways. They find that a single pass generally is adequate for coating all stone. In West Virginia, Michigan, New York and California, highway engineers cite these advantages: (1) No heating is required to load or unload Bitumuls Retread, (2) Mixing operations are not handicapped by wet aggregate, (3) Greater spread in volume per day per unit.

With Bitumuls Retread, worn road sur-

faces are literally transformed in appearance, riding properties, and durability, at comparatively low cost. In addition the large volume possible with this simple reconditioning method makes it the *fastest* effective method available.

Call the Bitumuls Field Engineers near you for data on Bitumuls Retread or specifications on other Bitumuls emulsified asphalts you can use on a full range of construction types.

Manufacturers of BITUMULS and LAYKOLD Products

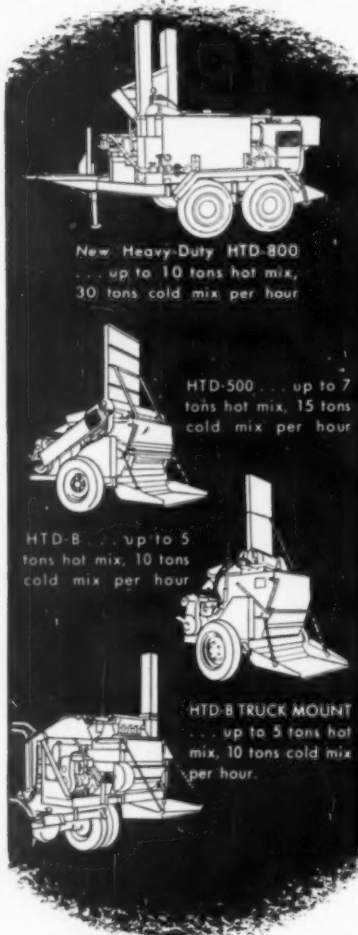
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... for more details circle 179, page 14

McConnaughay HOT ASPHALT MIXERS



... for resurfacing and patching in any season

Designed for economy of operation and fast production, the McConnaughay line of Asphalt Mixers meets every need for most resurfacing as well as all types of pavement patching. Working on location, McConnaughay HTD Mixers provide the exact amounts of materials needed and effectively remove both moisture and solvents from bituminous mixtures... positive assurance that patches and resurfaced areas will set up hard. For details and specifications on the mixers above and on the JR and HTD-LP models (not illustrated), write, wire or 'phone...

ASPHALT EQUIPMENT CO., INC.

3929 Buell Drive, Fort Wayne, Indiana

National distributors for
K. E. McConnaughay, Lafayette, Ind.

... for more details circle 213, page 14

VIEWS AND COMMENTS

Progress Comes By Steps

By H. G. Nevitt

THE data required for better bituminous design are slowly accumulating. The bituminous concrete tables recently put out by the National Slag Association represent another contribution in this field which should be of interest to both those utilizing slag and to designers in general.

As we have had previous occasion to comment, there is need for a more fundamental bituminous design technique. One route to this goal will be through contributions which suggest a design technique, data on the mixes resulting therefrom, and observations on their action in practice. These requirements are more or less met by the NSA booklet. If we can get enough data of this type — particularly field tests in which the action of the mix in all respects is observed and, if possible, followed up by use experience — we can decide on what are really the best mixes, look for common denominators among them, and with this background then test new theories of design. Unfortunately the converse has been the usual procedure; that is to say, new theories have been advanced and supported merely on the basis that mixes produced by them seem to have produced reasonably good results in use. More than this is required; and if the basic data from all tests are carefully kept, it should eventually provide the key to a really rational method of bituminous design which will apply to any and all materials under known conditions of application.

This NSA booklet emphasizes some interesting points, even if they are not exactly new. The design formula contains an indicator for the openness of the mixes. This is a desirable point, although this should really be checked by the mix characteristics.

The discussions refer to the work of Furnas. These very important contributions do not seem to be well known to bituminous engineers. While our personal approach is a slightly different one than the Furnas formula, the results in practice are about the same; and his work opens a fertile field for elaboration of the principles brought out.

Another point in the booklet is the emphasis on the mix as a volume rather than weight combination, with consequent need for recognition of specific gravity effects. This point is an old one but errors due to ignoring it are still common. We believe they are seen more frequently in connection with the bitumen than the aggregate, but good design demands that both be taken into account.

From the practical standpoint at least there is progress in bituminous design. The advance is not so much in getting superior results but in the greater frequency of satisfactory mixes. Accompanying this is a considerable amount of probing into the underlying factors determining the final understanding of the basic principles involved. However, we feel it again necessary to emphasize that there is a basic need for correlation of mix properties with the over-all load support provided — particularly the reinforcing effect given the base by a good bituminous top, since the design of mixes to withstand surface stresses is fairly well understood, and currently acceptable results from this standpoint can be achieved by a number of approaches.

The critical factor in any structural design is the over-all (or life) cost required to give the needed service. Maintenance requirements, the ability to carry heavier loads with time, adaptability to adding traffic capacity in the old structure, are therefore of equal importance to initial suitability. As we frequently emphasize, it is no longer difficult to get a design that will not fail at least in the first few years; but what we now need is a design which, in addition to doing this, gives maximum reinforcement to the structure as a whole. As knowledge in this respect increases, the economic advantages of the bituminous pavement will become even more pronounced than at present.

Generally speaking, we have not yet succeeded in exploiting to the full the basic merits of the flexible pavement, or of the bituminous binder which accounts for its peculiar advantages.

Current and Needed Research in Asphaltic Road Materials

By **E. F. Kelley**

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There is still a lack of any generally accepted tests which are measures of the quality of an asphalt for highway use. The author reviews the shortcomings of present tests and suggests areas for future study.

TWENTY years ago, in December of 1935, I discussed the same subject at a meeting of the Highway Research Board (1). Many of the things which I said at that time are as true today as they were then. However, important advancements have been made during the last two decades, with the result that my rather pessimistic attitude of 1935 has changed to one of optimism in 1955.

The quality of an asphalt is influenced by the crude petroleum from which it is derived and by the methods used in refining it. In the United States we have asphaltic materials produced from many varieties of crude petroleum and by many refinery processes. The result is that we have many different asphalts which will meet standard specifications for asphaltic road materials, but not all of these are necessarily of satisfactory quality. This is because existing standard specifications do not contain requirements and are indicative of quality.

Specifications for engineering materials generally include two types of requirements. First are the construction requirements to insure that the materials will be physically suitable for use in the proposed construction. Second, there are requirements to insure that the materials will be of satisfactory quality. For example, a construction requirement for crushed

stone is that it shall have a certain maximum size and meet certain grading requirements. Quality requirements for the same crushed stone may involve tests and test limits indicative of abrasive resistance and durability.

Similarly, certain construction requirements are commonly found in specifications for asphaltic road materials. Thus, we have limitations on consistency, such as the penetration of asphalt cement and the viscosity of cutback asphalts, to insure that the material will be of a grade which will be satisfactory for the type of construction in which it is to be used. Also, for cutback asphalts, we have the distillation requirements whose purpose is to insure that the material will cure or harden at the desired rate.

Better Quality Controls

What I have termed construction requirements are not, from the standpoint of this discussion, a matter of concern. They are mentioned in order to distinguish them from the quality requirements.

After more than fifty years of experience in the use of petroleum asphalts for road construction we still lack any generally accepted tests which are measures of quality. What we need are tests and tests limits, suitable for use as specification requirements, which will result in the acceptance of asphalts of good quality and the rejection of those of poor quality. The effort to develop such tests has been responsible for a great deal of research in recent years.

The most important quality of an asphaltic road material is its ability to resist the destructive effects of the heat to which it may be subjected during construction and the heat and other weathering agencies to which it will be exposed in the road surface.

When an asphalt cement is heated and mixed with hot aggregate in the production of a paving mixture such as sheet asphalt or asphaltic concrete, it is exposed in very thin films to the action of heat and air. The asphalt loses some volatile material, is subjected to oxidation, and hardens, with a resultant reduction in penetration and frequently a reduction in ductility. The amount of hardening which takes place is dependent on the degree of heat to which the asphalt is subjected and on the asphalt itself. For the same temperature and time of mixing, some asphalts harden much more than others.

After the hot-mix pavement has been constructed and opened to traffic, the asphalt continues to harden. Eventually it may become so hard and brittle that the pavement will crack and ravel and require either resurfacing or reconstruction. The hardening of the asphalt which takes place in the mixing plant is caused by heating to high temperatures, and that which takes place in the pavement is caused by long exposure to light and atmospheric temperatures. However, it has been determined that the hardening of the asphalt in a pavement is influenced much more by high temperatures than it is by light. The

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Highlights of Research Status and Need in This Field

- The most important quality of a road asphalt is the ability to resist destructive effects of heat during construction and other weathering agencies in service.
- Heat susceptibility of asphalts as presently measured may not be directly related to the susceptibility of the finished pavement.
- The standard ductility test is also questioned as a quality index, but still has its virtues. Ductility and heat susceptibility suggested as subjects for future research.
- The Bureau of Public Roads has consistently refused to embody in its specifications identification tests which bear no relation to the quality obtainable with various asphalts.
- The status of extraction tests and tests for hardening and anti-stripping, is discussed in detail by the author.
- The most important current research is on resistance to hardening and on anti-stripping.
- New progress is in sight as a result of cooperative action by highway material engineers and refinery technologists.

rate of hardening of the asphalt in the pavement is influenced by the type of mixture, the climatic conditions and the character of the asphalt.

In addition to differences in rate and degree of hardening caused by construction operations and subsequent exposure to the weather, asphalts also differ in their susceptibility to changes in temperature. Thus, of two asphalts of the same penetration grade, one may be considerably more fluid than the other at the high temperatures used in mixing and considerably more viscous at low temperatures. Temperature susceptibility of an asphalt is a matter of practical concern because at the mixing temperature the asphalt must have a suitable fluidity, neither too viscous nor too fluid, if satisfactory mixtures are to be obtained. However, all that is necessary is to recognize that these differences exist and to control the mixing temperature at a level which will insure that the asphalt has a viscosity within the required range.

Whether or not the temperature susceptibility of an asphalt is any measure of its quality is still a moot question. It is apparent that an asphaltic pavement should not be too soft in hot weather nor unduly hard and brittle in cold weather. However, there is some evidence to indicate that the susceptibility of the asphaltic material itself, as it is ordinarily measured, is not directly related to the susceptibility of the finished paving mixture.

Another time-honored test, presumed to measure quality, is that for ductility. Certainly an asphaltic pav-

ing mixture should have ductile properties but whether the standard ductility test is a satisfactory index of the desired quality has not been proven

It seems very possible that asphalt in thin films, as it exists in a paving mixture, does not have a temperature susceptibility or a ductility comparable to these properties as measured in the relatively large masses of asphalt which are used in the standard laboratory tests. At the present time there is no convincing evidence that a low susceptibility to temperature is an essential characteristic of a satisfactory paving asphalt. Neither is there convincing evidence that ductility, in itself, as determined in the laboratory, is a direct measure of an essential quality. However, the ductility test has other virtues and should be retained in standard specifications until such time as it is shown to be unnecessary. Studies of the true significance of temperature susceptibility and ductility are suggested as appropriate subjects for future research.

Asphalt Properties Vary

Engineers concerned with asphalt paving have long been aware of the variations in the properties of asphalts that have been mentioned. As a result there have been proposed, from time to time, special specification requirements designed to limit the asphalts furnished to those with which the particular engineer has had a satisfactory experience. The differences in temperature susceptibility of asphalt cements, with the resulting variations in fluidity at a given mixing tempera-

ture, have been a fruitful source of dissatisfaction. Thus, engineers accustomed to work with Mexican asphalts, which require a relatively high temperature to render them sufficiently fluid for proper mixing, got poor results when they used the same procedures with asphalts that were considerably more fluid at this temperature. Instead of reducing the mixing temperature to a level which would give the proper fluidity for mixing, many engineers concluded that asphalts of the greater susceptibility to temperature change were unsatisfactory for use and took steps to exclude them.

Thus, some twenty-odd years ago, proposals were made for a variety of special requirements designed to exclude asphalts which did not have a relatively high viscosity at the relatively high mixing temperatures then commonly used. The special tests proposed included the so-called fluidity factor, the float test index and a number of requirements which involved some specified relation between penetrations at different temperatures. It is unnecessary here to discuss the details of these special requirements or of others, not related to temperature susceptibility, which were proposed in the hope of insuring that asphalt of satisfactory quality would be furnished. It is sufficient to say that as they were used, or proposed for use, they were identification tests and not tests of quality. It was known then, as it is now, that while these identification tests might exclude certain asphalts of questionable quality available in a certain area, they would also exclude asphalts which had a record of satisfactory performance in other areas.

The development of identification tests and the promotion of their use, which started many years ago, has continued to the present time. There are still competent engineers who believe that, in the absence of tests which are true measures of quality, restrictive identification tests, either some of the old ones or others more recently developed, should be used arbitrarily to prevent the acceptance of asphalts which, on the basis of their experience, they are convinced are of unsatisfactory quality.

The Bureau of Public Roads is fully aware of the situation and is in sympathy with the desire to prevent the use of poor asphalts. However, it has consistently refused to approve the inclusion of identification tests in specifications for use on Federal-aid highway construction. The primary reason for this is that it is wrong in principle to prohibit in one State the

use of an asphalt which is being used with satisfactory results in another State. A secondary consideration is that if approval were given to all the discriminatory tests which have been and are being proposed, the asphalt specifications of the State highway departments would soon be in a chaotic condition, unsatisfactory alike to consumer and producer. Finally, the Bureau of Public Roads is called on from time to time to defend its decisions. There would be no adequate defense for the approval of identification tests which bear no direct relation to the quality of the product and which could operate to prevent the use of asphalts of known satisfactory performance.

As has been stated, asphalt hardens during the construction of a hot-mix asphalt pavement, it continues to harden after the pavement is placed in service, and different asphalts harden at different rates. These facts were known long before there was a satisfactory method for measuring the amount of hardening which had taken place at any stage in the life of an asphalt pavement. But eventually the development of the Abson recovery test (2) made such a method of measurement available. This method makes it possible to recover an asphalt, after it has been extracted from a paving mixture, in substantially the same physical state as that in which it existed in the mixture. It may then be tested for such characteristics as penetration, softening point and ductility.

Michigan Experience

Apparently the first practical use of this method was by the Michigan State Highway Department in 1935. In that year the Department adopted a specification (3) which provided for the recovery and testing of asphalt extracted from pavements immediately after the finishing operations had been completed. If the penetration of the recovered asphalt was less than 50 percent of its original penetration or if its ductility was less than 40 centimeters, the contractor was penalized. These specification requirements are still in effect although the permissible reductions in penetration and ductility have been modified somewhat. They have been effective in preventing the use of asphalts which harden unduly during mixing and placing but they have the practical disadvantage that neither the asphalt producer nor the contractor can have definite assurance, in advance of its use, that a given asphalt will pass the test.

Another application of the Abson recovery method for the control of the

quality of paving asphalts was made in the Shattuck mixing test (4) used in connection with sheet asphalt construction in the City of Detroit. In this test a standard mixture of Ottawa sand and asphalt is mixed hot in a small rotary laboratory mixer and subsequently is heated in a shallow pan in an oven. Upon completion of the standard procedure, which involves the control of time and temperature, the asphalt is extracted, recovered by the Abson method, and tested for penetration, ductility and softening point. The test is also applicable to asphaltic mixtures containing aggregate ranging in size from 1 inch to dust. The use of this method of test permits a determination of the acceptability of an asphalt before it is used.

A laboratory test which, without resort to the Abson method of recovery, gives a measure of the ability of an asphalt to resist heat is the thin-film oven test developed in the laboratories of the Bureau of Public Roads (5). This test is a modification of the standard A.S.T.M. test for loss on heating (A.S.T.M. Designation D-6), the only difference being that the sample of asphalt is heated in a shallow pan instead of in the relatively deep standard ointment box. The sample of asphalt, of the same volume as in the standard test, is exposed in a film about $\frac{1}{8}$ inch thick, with the result that the exposed area is more than six times that of the standard test and there is a much greater opportunity for oxidation. After the 5-hour heating period the loss in weight is determined and the residue tested for penetration, ductility and, if desired, softening point. It has been found that the hardening of the asphalt which takes place in this test is comparable with that which takes place during the mixing and placing of an asphaltic pavement. For research purposes the time of heating may be, and sometimes is, prolonged beyond the 5-hour period.

Another method of measuring the resistance of an asphalt to hardening is by means of the Hveem abrasion test (6). In this test, molded specimens of mixtures of Ottawa sand and asphalt are weathered in a special weathering machine which employs an air temperature of 140°F. and direct rays of standard drying lamps, which emit the bulk of their energy in the infrared band. The specimens are weathered for nine cycles of 5 hours each. After each 3-cycle interval they are tested at 60°F. for resistance to abrasion by dropping a stream of shot on the surface of the specimen, all details of the procedure

being carefully controlled. The resistance to abrasion, as determined by the loss in weight of the specimen, is a measure of the hardening of the asphalt which has taken place, those asphalts which harden most being the least resistant to abrasion.

The Bureau of Public Roads, in its laboratory research has used a modification of the Hveem abrasion test in which the specimens have been weathered in an oven at 325°F. rather than in a special weatherometer at 140°F., and in which the test for abrasion was made at 77°F. rather than at 60°F. (7).

Weather-Strength Test

Another test used by the Bureau of Public Roads has been the weathering-strength test. This test involves the exposure of molded cylindrical specimens of mixtures of Ottawa sand and asphalt in an oven at 325°F. for various periods of time and determining their compressive strength. The hardening of the asphalt is evidenced by an increase in compressive strength. The asphalt in specimens weathered in this manner has also been extracted and recovered and a determination made of penetration, ductility and softening point.

Lang and Thomas (8) studied the hardening properties of asphalt cements of the 85-100 penetration grade by exposing mixtures of Ottawa sand and these asphalts to the action of ultraviolet light and heat and also to natural outdoor weathering. At the end of the exposure periods the asphalts in the weathered mixtures were extracted and recovered by the Abson method. The same asphalts were subjected to the thin-film oven test for a 25-hour period. There was a good correlation between the penetrations of the asphalts from the weathered mixtures and the penetrations of the residues from the thin-film oven test. The authors concluded that the hardening produced by natural weathering is very similar to that produced by exposure to artificial heat, air and ultraviolet light. It was also very similar to the hardening produced in the thin-film oven test.

Mention has been made of the Shattuck mixing test, the thin-film oven test, the abrasion test as developed by Hveem and as modified by the Bureau of Public Roads, the weathering-strength test, and exposure test as used by Lang and Thomas, as alternate methods for determining the hardening characteristics of an asphalt before it is used. With any of these tests the same degree of hardening can be obtained by varying the time or the temperature of ex-

posure. Of these tests, the thin-film oven test is the most suitable for use in specifications for three reasons. First, it requires the least amount of time. Second, the hardening of the asphalt is measured directly rather than indirectly as in the abrasion test and the weathering-strength test. Third, it does not require the extraction and recovery of the asphalt, as in the case of the Shattuck test and exposure tests similar to those of Lang and Thomas, and thus eliminates any uncertainty regarding the effect of the recovery procedure on the characteristics of the weathered asphalt.

Thin-Film Test

The thin-film oven test gives promise of being a most useful quality requirement for insuring that asphalts will have a satisfactory durability. However, although we now have fairly definite ideas regarding suitable test limits, the general adoption of the test for use in specifications will require a period of trial to more firmly establish these limits or to indicate wherein they need correction.

The thin-film oven test has been criticized because the one-eighth inch film of asphalt that is exposed is much thicker than the films of asphalt which exist in a paving mixture. This criticism overlooks the fact that the hardening which takes place in this test has been correlated with the hardening which takes place in the thin films of asphalt in sand-asphalt mixtures.

However, we now have a laboratory test in which the asphalt is weathered and tested in very thin films. This is the microfilm durability test of the Shell Development Company (9). In this test films of asphalt about 5 microns in thickness are placed on glass plates and weathered in an oven. The weathered asphalt is then placed in a thin film between two glass plates and the upper plate moved over the lower one. The shearing stress and rate of shear are measured and from them is calculated the absolute viscosity. The ratio of the viscosity of the weathered sample of asphalt to that of the asphalt before weathering gives an index of the hardening which has taken place.

The hardening of an asphalt when heated in air is caused by loss of volatiles and by oxidation. In the microfilm durability test it is possible to prevent oxidation by heating the sample in an inert gas, such as nitrogen, and thus determine the hardening which is caused by loss of volatiles. It is also possible to determine the viscosity of an asphalt extracted from a paving mixture without the necessity

of recovering it by the Abson method. This test should prove to be very useful in research work on the weathering characteristics of asphalts and eventually it may be found suitable for use in specifications as an acceptance test. One investigation of immediate interest is to determine the relation, if any, between hardening as measured by the microfilm durability test and hardening as indicated by the thin-film oven test. One essential difference between the two methods of test is that in the microfilm test, on account of the very small amount of asphalt used, there is no possibility of measuring any characteristic other than viscosity.

The durability of asphalt, as indicated by its resistance to hardening, has been discussed in detail because it is the most important property of the asphalt itself. Another property which merits attention is the ability of the asphalt to coat the particles of mineral aggregate with which it is used and to adhere to those particles in the presence of water. Here we have an inter-relation between the character of the asphalt and the surface character of the aggregate, in which the latter is the most important. Asphalts vary in their ability to coat aggregates and to adhere to them in the presence of water but mineral aggregates vary over a much greater range in their ability to mix properly with asphalt and to retain the asphalt coatings. With some highly hydrophilic aggregates it is practically impossible to obtain a satisfactory, moisture resistant coating with any asphalt which has not been specially treated. When aggregates fail to retain their coatings of asphalt they are said to have stripped and stripping is an important cause of failure in asphaltic road surfaces.

It is possible to treat an hydrophilic aggregate so that it will be resistant to stripping but it is generally more convenient and economical to treat the asphalt. And this brings us to the subject of anti-stripping agents. These are chemicals used for the treatment of asphalt to improve its resistance to stripping. First of all, they are wetting agents which make it possible to coat moist or wet aggregates with asphaltic materials, a matter of importance in types of construction in which the aggregates are not preheated and dried. Second, they are intended to improve the adhesion of bituminous films to aggregates in the presence of moisture and thus, in all types of asphaltic surfaces, make possible the use of aggregates or asphalts which otherwise would be unsatisfactory.

Laboratory tests with bituminous mixtures in which cutback asphalts were used have indicated that a number of these anti-stripping additives are very effective in increasing the resistance to water of mixtures of these particular types. Worthy of note is the indication of these tests that an additive that is effective with one aggregate is not necessarily equally effective with all other aggregates. But these findings pertain to mixtures which contain cutback asphalts and which are mixed at normal or only slightly elevated temperatures. They do not necessarily apply to mixtures which contain asphalt cement and which are mixed at relatively high temperatures.

Anti-stripping additives for use in the treatment of asphalt are a development of the last twenty years. During the early period of this development the additives which were placed on the market were not resistant to heat. When used in hot asphaltic mixtures they lost their essential properties and the resulting pavement showed little or no benefit. More recently there have become available improved additives which laboratory tests have shown to be heat resistant (10). The degree of benefit which will result from their use in asphaltic concrete pavements remains to be determined.

Two tests have been used by the Bureau of Public Roads to measure the effect of water on bituminous-coated aggregates or asphaltic paving mixtures and to determine the relative merits of the various anti-stripping additives which have become available.

Static Immersion Test

One of these, called the static immersion test, is a stripping test applicable only to mixtures of asphalt and coarse aggregates. This is a modified Oberbach test in which the coated aggregate is immersed in distilled water which is maintained at an elevated temperature, usually 100°F. or 120°F., for a definite length of time, usually 24 hours. On the basis of a visual examination an estimate is then made of the percentage of the surface area of the aggregate which remains coated. Important criticisms of this test are that the results are estimated by visual examination and thus are lacking in precision and that it is applicable only to asphalt mixed with coarse aggregate although fine aggregate and filler may have an important effect on the water-resistant properties of an asphaltic mixture. Thus, it cannot give a direct measure of the effect of moisture on the

Conclusions on Research Need

The most important current research is directed toward the development of specifications which will insure the use in highway pavements of asphalts having a satisfactory resistance to hardening. This work is far from complete and should be continued. Both the thin-film oven test and the microfilm durability test are promising but more work is required to determine the relation between results of two tests and to correlate test results with pavement performance.

Of somewhat secondary importance in current research is the investigation of anti-stripping additives. Future research in this field should be aimed at the improvement of the static-im-

mersion test or the development of a new test for the same purpose and at the determination of the improvement in hot-mix asphaltic pavements which may result from the use of heat-resistant anti-stripping additives.

Two questions of practical importance remain to be explored. Is the ductility of an asphalt or its susceptibility to temperature change, as measured in the laboratory, reflected in the performance of pavements in service?

In contrast to the outlook of 20 years ago, we can now look forward with confidence to the solution, of the problems which have been discussed and which are so important to the highway engineer.

paving mixture as a whole and therefore is of only limited value in the selection of materials for asphaltic concrete. However, it has a direct application in the selection of coarse aggregates for surface treatments or bituminous macadam. Also the test as described, or with modifications, is used to some extent for the acceptance of asphalts, treated or otherwise, under specifications that require the asphalt to have some definite degree of resistance to stripping.

A number of investigators have made serious efforts to develop a stripping test which will yield results not subject to the personal error of the static immersion test. Such a test would be very useful but thus far the efforts to develop it have not been particularly successful (11). This accomplishment remains for the future.

The second test, which has been used extensively by the Bureau of Public Roads and which has now been standardized by the American Society for Testing Materials (12), is the immersion-compression test which is applicable to the paving mixture as a whole. In this test the paving mixture, composed of coarse aggregate, fine aggregate, filler and asphalt in the proportions desired, is molded under pressure into 4-inch by 4-inch cylindrical test specimens. After the specimens have been cured, one set is tested to determine its compressive strength. A duplicate set of specimens is immersed in water, which is maintained at some elevated temperature, and soaked for a definite length of time, usually four days. The soaked specimens are then tested in compression and any loss of strength, resulting from the action of water, is determined. Loss of strength of the soaked specimens may be the result of film stripping or other causes. The cause, whether it be associated with the

coarse aggregate, the fine aggregate, the filler or the asphalt, may be determined by a series of tests in which the different variables are controlled. The test has also proven useful in determining the relative effectiveness of various anti-stripping additives.

As standardized by the A.S.T.M. the test method is applicable only to mixtures containing penetration-grade asphalts. However, there appears to be no good reason why the use of the immersion-compression test should be thus limited. In the laboratories of the Bureau of Public Roads it is also applied to mixtures containing cut-backs and emulsions, the procedures followed being somewhat different than with asphalt cements (13).

Attention has been given in this discussion to the static immersion test and to the immersion-compression test because they have been very useful tools in past research work on asphalt and asphaltic paving mixtures and doubtless will continue to be so. It is to be hoped that future research will result in perfecting the static-immersion test.

To a great extent, past research on the properties of asphaltic road materials has been conducted by various agencies working independently of each other. A possible exception to this general statement is the fundamental study of asphalts which is being carried on by the Franklin Institute with the support of numerous other agencies including a number of asphalt producers (14). However, this activity has not yet resulted in the release of any useful data.

It has long been recognized that a successful attack on the determination of the essential properties of asphaltic road materials requires the combined effort of highway materials engineers and the technologists associated with the asphalt producers.

This is because the latter are experts in the problems connected with the production of asphalt from petroleum. They know more than the highway materials engineer can ever hope to know about the intricate relation between crude petroleum, refinery processes and the quality of the product.

Until rather recently it has not been possible to secure the desired cooperation between producer and consumer interests for the attack on this problem. However, during the current year there has been organized the Highway Research Board Advisory Committee for Asphalt Research and Development. The members of this committee represent both the highway interests and the manufacturers of asphalt. It is too early to know the objectives of the research which this committee will sponsor but it is at least encouraging to be able to hope that at last we are on the threshold of acquiring the knowledge for which we have been waiting so many years.

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Missouri plans 2,900 miles of oil treatment

More than 2,900 miles of presently graveled state highways will get oil surface treatment next summer under the 1956 oiling program approved by the state highway commission. This is the largest such program yet to be undertaken by the commission and will affect roads in every section of the state. The improvements will cost about \$5,000,000.

Surface improvements on this road

mileage will be made possible by a lowering of traffic volume requirements necessary before such work is done. Under a revised commission policy all state highways having an annual daily average of 125 vehicles or more are to be given oil surface treatment.

For the past year the yardstick was 200 vehicles per day and prior to that was 250 vehicles per day. The traffic volume reductions have been made in recognition by the commission of increasing demands and needs for more dustless surface highways as a service to highway users.

Highway officials emphasized that no roads being maintained as temporary state routes under the 10-year highway program are included on the approval list. Nor will such roads be considered until all right of ways needed to develop them to supplementary highway standards have been made available without cost to the state, the roads given permanent state supplementary highway status, and so developed. It was pointed out some such routes even now may have the required count, but even so they cannot qualify until the other conditions are met.

Actual application of the bituminous material will not be made until next spring and summer, since that work is a warm weather operation. However, highway maintenance forces already have begun giving special maintenance attention to many of the roads affected to get them ready for the finishing process.

County oiling contract covers 948 miles

The Midwest Pre-Cote Company of Kansas City, Missouri, late in August completed a contract for oiling 948 miles of dirt roads in Jackson County around Kansas City, Missouri.

The oiling job which is an annual affair for the unsurfaced and dusty back roads in the county, was handled under a contract totalling \$237,000 and requiring 2,443,400 gal. of road oil or an average of about 2,600 gal. per mile.

The contractor which has extensive facilities at Kansas City performed this dust-laying and stabilizing operation under an open schedule, in which the county inspectors notified the contractor from day to day just where to be on hand with the distributors, and with how much gallonage for the day's operation.

Officials see demonstration of new "Slurry Seal"

A fast, low-cost method of improving the riding qualities and extending the life of cracked or traffic-worn pavements was demonstrated recently before the 40th annual convention of California County Supervisors and Engineers.

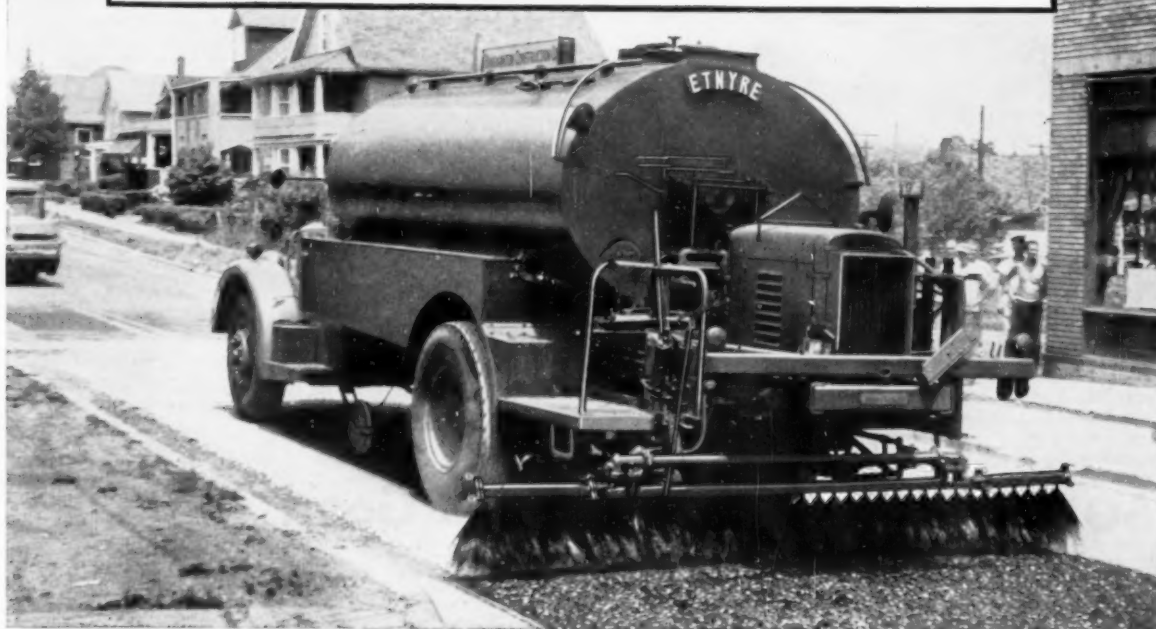
Called "Bitumuls Slurry Seal," the new technique was demonstrated on a Monterey county road. The seal employed a mixture of fine aggregate, SS-1 (or SS-2) emulsified asphalt, and water. A transit mix truck was used for the blending of materials, and the liquid slurry was fed directly into a sled-type box, equipped with a rubber-edged, squeegee-type strike-off, drawn behind the mixer truck.

The slurry seal, as demonstrated, penetrated and sealed cracks, filled minor depressions, and provided a new, even surface, pleasing in appearance, all in one, quick application. This seal reportedly does not "bleed," and provides an excellent surface on which to apply the conventional chip seal coat if desired. Preliminary tests in connection with the sealing work were conducted by the materials laboratory of Monterey county.



● Demonstration of slurry seal technique before California county supervisors and engineers featured use of simple sled-type box, fitted with a rubber-edged squeegee-type strike-off.

9th Etnyre is a one-man job!



Binghamton Construction Co., Inc. standardizes on Etnyre "Black-Toppers"

Convenience for the operator is one of the biggest advantages of Etnyre "Black-Toppers" according to Ray Fuller of the Binghamton Construction Co., Inc., Binghamton, N. Y. Nine Etnyres are now in the Binghamton fleet. This newest model is operated by one man, saving on labor costs. With this arrangement, the relieving feature of the spray bar when bar hits an obstruction is highly important.

In Mr. Fuller's opinion, material heats quickly in the Etnyre; the "Black-Topper" is easier to load and to drain; even distribution is assured; and rapid changes can be made in thickness of application. Photograph at right shows another Binghamton "Black-Topper" being used with handspray attachment to treat corners on a bridge approach.



Get the complete story now on all of Etnyre's superi-
orities. Data and prices are yours for the asking from
your nearby dealer, or by writing E. D. Etnyre & Co.,
Oregon, Illinois, U.S.A.

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ETNYRE

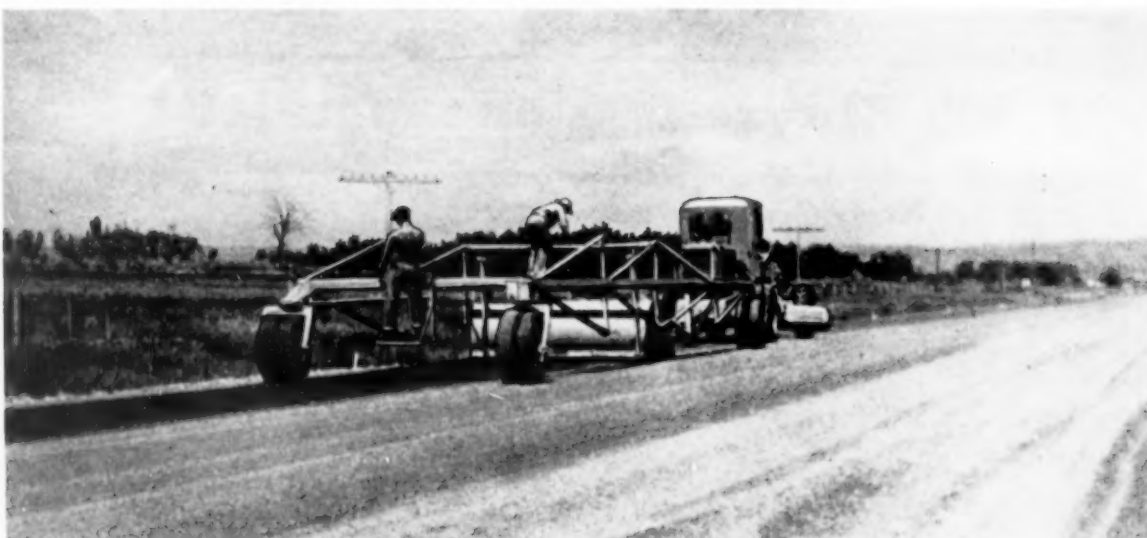
"Black-Topper"

BITUMINOUS DISTRIBUTORS

... for more details circle 193, page 14

ROADS AND STREETS, January, 1956





● The land plane at work on Idaho U.S. 26 project. A smoother riding surface was provided on sections where the plane was, compared with sections leveled by ordinary methods.

60-Foot "Road Drag" Does Good Job

Land plane used experimentally shows good possibilities for achieving superior riding quality on gravel road projects not involving sharp vertical curves.

By B. E. Sessions

Resident Engineer, Idaho Department of Highways, Boise, Idaho

THE Idaho department of highways has come up with another "first" in employing a 60-ft. land plane experimentally on a gravel surfacing project. The job involved 9.6 miles of U. S. 26.

The idea of using the land plane for leveling gravel arose from the observation, that due to the increasing road widths and the greater gravel tonnages, even the heaviest and newest motor graders ably handled sometimes resulted in undesirable irregularity of profile. The means heretofore used to eliminate these "rolling" sections was a reshaping process, which resulted in considerable segregation, and was generally unsatisfactory from the contractor's point of view as well as the department's. The old method was time-consuming, and did not produce desired results.

Use of the land plane, or some such device with a longer wheelbase, had been discussed with this contractor on other projects. Since a 60-ft. land plane was readily accessible to this project, he volunteered to acquire it

for the experiment to satisfy his own curiosity as well as the engineer's.

The road was blue-topped from the subgrade up, including the subgrade, the last course of 2 in. base material, and the last course of $\frac{1}{2}$ in. surface gravel. The last $\frac{1}{2}$ in. material was laid in eight sections on the total project, two of which were not land planed. Those which were planed, showed a marked improvement over those not planed.

Propulsion was the first problem encountered. A front-end loader, first tried, operated satisfactorily over a well-laid section, but when the load increased the loader was not adequate. The contractor then hooked up a Caterpillar D7 tractor, which was more than adequate, but was slow. Finally a Cat 12 motor grader was tried and found to have adequate pulling power as well as speed. This worked out well and the operator could signal to the men on the plane for any adjustments he desired.

The gravel was watered in the normal amount, processed thoroughly,

and laid with a motor grader, as during an ordinary laying operation. Blue tops for top of surface gravel had previously been set on the shoulder line. Once the lay was completed the quarters, crown, super-elevation and transition sections were checked and any noticeable irregularities were rectified before land plane operations were started.

● The plane was then hooked up to the grader and started its round. The first pass was made with the edge of the plane near the crown, and successive passes were made with the edge of the plane near the crown, and successive passes were made down alternate sides, working out to the shoulder until the roadbed had been planed. The grader operator then made a pass down the shoulders and bladed off any segregated material which had accumulated.

The essential part of this operation was to immediately precede the plane with a liberal shot of water and immediately follow with rollers. At first considerable segregation resulted, but the addition of water immediately ahead of the plane eliminated this. The only other problem encountered in taking too heavy a cut, or letting the mold board run dry, which resulted in rock tailings. It was found that by setting the blade to cut about $\frac{1}{2}$ in. at the beginning of a run, and leaving it alone, the plane would pick up enough gravel and hold it through-

With the Manufacturers and Distributors

MARION NAMES REED DIRECTOR OF ADVERTISING. Dudley B. Reed, Jr., has been appointed director of advertising and public relations for Marion Power Shovel Co., Marion, Ohio. Harold E. Bonecutter continues as advertising manager for the company.

DETROIT DIESEL PROMOTES HUNTER. Robert E. Hunter, heretofore director of sales of General Motors Diesel Limited of Canada, has been appointed general sales manager of Detroit Diesel Engine Division of General Motors, Detroit. He replaces E. F. Bentley, who is on special leave of absence.

out the run, uniformly cutting the high places and filling the low ones without overloading or running out.

There is a marked difference in the riding qualities of sections planed and those which were not. It should be noted that a 60-ft. land plane, such as used on this project would be suitable only for projects with similar grades and alignment. Sharp vertical and horizontal curves would be warped out of shape by a plane of this length. This length plane was ideal for this job, however, since it rode uniformly over the vertical curves and seemed to fit horizontal curve transitions well.

- The only objectionable feature of the operation from both the contractor's and state's viewpoint was turning the plane around at section ends. The unit, with no means of raising the blade more than a foot, gouged the surfacing when either the front or back wheels dropped more than it was possible to raise the blade. In addition to this, the plane is burdensome and requires a great deal of room to turn, since it was steered by the back wheels only.

An improvement would be to have hydraulically operated ram-type dolly wheels located at the center of the plane which could be carried off the ground when planing, and lowered to pivot the plane when turning around, thus making it unnecessary for the plane to leave the roadbed. Speedier raising and lowering of the blade and hydraulic steering would also be a desirable feature.

The plane was made by the Marvin Manufacturing Company. The Idaho department of highways was represented by district engineer, H. B. Sternberg, and resident engineer B. E. Sessions. Earle V. Miller is state highway engineer.

HYSTER APPOINTS SHAFFER DISTRICT MANAGER. Donald R. Shaffer, formerly manager of Long Island City, N. Y., office of Hyster Co. is now district manager of the North Central district of the eastern industrial truck division of Hyster Co., Portland, Ore.

D'HAEM APPOINTED DIRECTOR OF EUROPEAN SALES. A. Phillip D'Haem has been appointed director of European sales for Gar Wood Industries, Inc., Wayne, Mich. D'Haem, previously export sales manager for Gar Wood, joined the firm in 1948. With offices in Paris, France, D'Haem will direct Gar Wood Sales operations in Europe, the near East, and all of Africa.

BRITTON NAMED MANAGER DISTRIBUTOR SALES. G. O. Britton has been appointed manager of distributor sales for American Hoist and Derrick Co., St. Paul, Minn. Prior to his connection with American Hoist he was general sales manager of the Schield Bantam Co., starting there in 1949 after a stint as domestic sales manager of Athey Products Co.

CLARK EQUIPMENT TO EXPAND PLANT. Clark Equipment Co. will expand its new Construction Machinery Division plant in Benton Harbor, Mich. by 50%.

NEW LIMA DISTRIBUTOR. Krider Equipment Co., Fargo, N. Dak., has been appointed distributor for Lima shovels, cranes, draglines and pull shovels by Baldwin-Lima-Hamilton Corporation, Construction Equipment Division, Lima, O. The distributorship covers the entire state of North Dakota as well as three bordering counties in Minnesota: Clay, Norman and Wilken.

WORTHINGTON FORMS HOLYOKE DIVISION. Worthington Corporation's Holyoke (Mass.) works and sales operations have been combined as the Holyoke Division. William A. Finn has been appointed general manager of the Holyoke Division.

CATERPILLAR PROMOTES GROSS. Frank A. Gross, formerly assistant chief engineer at the Caterpillar new plant in Decatur, Ill., has been appointed an assistant to Vice President G. E. Burks, who has administrative responsibility for the engineering and research departments at Caterpillar Tractor Co. Gross has been succeeded by A. W. Sieving, formerly general supervisor of Decatur engineering.

POWELL NAMED PURCHASING DIRECTOR. Haity Powell has been appointed director of purchasing for Merritt-Chapman & Scott Corporation, Construction Department, 260 Madison Ave., New York 16, N. Y.

NEW EUCLID DISTRIBUTOR. Ray C. Call Co., U. S. Route 60, South Charleston, W. Va., has been appointed distributor for the complete line of earthmoving equipment of Euclid Division, General

Motors Corporation, Cleveland, O. The territory covers all of West Virginia except the counties of Brooke, Hancock, Marshall, Ohio, Morgan, Berkeley and Jefferson — and includes Garrett and Allegany counties in Maryland.

JONES PROMOTED BY MINNESOTA MINING. H. Vaughn Jones, formerly supervisor of reflective products at Chicago office, has been appointed divisional sales manager of reflective products by Minnesota Mining & Manufacturing Co., St. Paul, Minn.

WORTHINGTON PROMOTES LARAMY. John B. Laramy, formerly manager of the Marketing Research Department, has been appointed assistant general sales manager of Worthington Corporation, Harrison, N.J. Alvin F. Welsh succeeds him as manager of the Marketing Research Department.

EAGLE CRUSHER REPORTS INCREASED SALES. Eagle Crusher Co., Galion, Ohio, reports that sales of crushers and truck mounted loaders during the first nine months of this year were several times larger than for the corresponding months of last year. Controlling interest of Eagle was acquired at the year end of 1954 by Perfection Steel Body Co., Bucyrus, Ohio. Ralph A. White, manager of Perfection farm machinery division, was transferred to Galion as general manager of Eagle. Eagle Crusher Co. has a line of truck mounted loaders, jaw crushers, hammer-mills, and is developing the portable crushing plant phase of its activities.

REORGANIZES FIELD SALES ORGANIZATION. Twin Disc Clutch Co., Racine, Wis., has reorganized its field sales organization by appointing industry managers who will concentrate on those industries with which they are most familiar. C. W. Upp, formerly district manager at Cleveland, O., has been named industry manager, crane and shovel accounts.

GRAYSON NAMED VICE-PRESIDENT. John D. Grayson, formerly a divisional controller for Ford Motor Co., has been appointed vice-president and treasurer of American Tractor Corporation, Churubusco (Ft. Wayne), Ind.

BARES APPOINTS NEW ADVERTISING PROMOTION MANAGER. Paul E. Finical, formerly assistant advertising manager The Pennsylvania Tire Co., has been appointed advertising and sales promotion manager of Barnes Manufacturing Co., Mansfield, O.

NAPCO PROMOTES MULLIN. Roy E. Mullin has been promoted to the newly created position of general sales manager of Napco Industries, Inc., Minneapolis, Minn.

LINK-BELT ACQUIRES SYNTRON CO. Link-Belt Co., Chicago, Ill., has acquired the Synttron Co., Homer City, Pa., and it will be operated as a subsidiary of Link-Belt.

To The Editors

What is a Tough Asphalt?

To The Editor:

This is a belated observation on the discussion by Mr. Seivert of flexible pavements, in your May 1955 issue*. This subject is most timely. It is a thorough airing of the subject first so well pointed out by Mr. Nevitt.

We do want by all means to preserve and to secure flexibility in the finished pavement.

The decisive point of Mr. Seivert's discussion appears in the last small-print paragraph entitled "Author's Note." To the writer this is the crux as it were of the problem, and I wish to comment on it.

Assuming proper construction, proper bases, proper aggregates, sieve analysis, etc., this "Author's Note" states that:

"Flexibility is a most desirable property, but until tougher asphalt cements of satisfactory ductility, and new media to assure flexibility without lateral displacement come into use, its characteristics make it increasingly dangerous as traffic density and weight increase."

This is a most important point and the writer appreciates that Mr. Seivert at least mentions it. The character of the bitumen is too often entirely disregarded in paving discussions. The asphalt cement should be viewed as the most important constituent in the pavement. The asphalt cement or binder has to do a lot more things than to "just make the sand grains stick together."

Therefore the writer wishes to stress the following:

Avoid the use of vague expressions such as "tougher asphalt . . . of satisfactory ductility . . ." We are discussing the asphalt cement, or the bitumen.

The above terms are purely descriptive, and signify nothing.

If asphalts are to be made "tougher" we in the industry know that the ductility might well be far from "satisfactory." What is "satisfactory" and where are the standards of comparison here? Let's be concise; asphalt is an engineering material. We've had enough empiricism in the paving industry these many years. We must get down to fundamentals.

*"The Third Dimension in Paving," by H. Seivert; *ROADS AND STREETS*, May, 1955; p. 170.

If Mr. Seivert would state, for instance, in terms of engineering units what he means by "tougher asphalts," and by "satisfactory ductility," — and which he knows, not believes the new asphalt should have — if this were done, or other tests added, etc., I believe the bitumen will be made; I believe the asphalt manufacturer, and the petroleum industry stand ready to manufacture such binders. The challenge is tremendous, and the asphalt manufacturer, big and little, is a pioneer in meeting challenges.

It is believed that if the highway engineers and the materials engineers will step forth and put their requirements for the bitumen they actually and really know they must have, in the form of definite physical, chemical and engineering units, into a reasonable specification, the asphalt refiners will answer this question and come forth with the new asphalt of the future.

It calls for the people building roads to know what properties are needed in this new binder, and avoid such specifications which call for paradoxical or contradictory properties in the one and same material.

This subject calls for much more serious study of asphalts than what has been attempted in the past.

The physicist and especially the chemist is ready to take up the challenge; the refining industry is ready to make it. Let's hear what the highway engineers want in concise terms.

Edwin J. Barth
Asphalt Consultant
Northampton, Mass.

National Bituminous Concrete Association holds board meeting

The National Bituminous Concrete Association, organized some months ago, rolled up its sleeves recently as the board of directors met in Chicago.

The aims of this association as reviewed by president Sheldon G. Hayes, Detroit paving contractor, are to be primarily educational and promotional, supplementing the technical and research work presently being done on a national scale by the Asphalt Institute. He pointed to the shortage of engineers, particularly those with bituminous paving knowledge, and the need to stimulate interest among beginners in a long-range effort to develop engineering talent that will help the industry.

Definite plans were taken to appoint an executive director and the opening of a national office in Washington on or about the first of the year. The membership is steadily

growing and now includes representatives of 17 state associations, each consisting of contracting firms specializing in hot mix asphaltic concrete work. The membership also includes individual contractor or aggregate producer firms in 29 states and associate members in the field of equipment and material supply. Plans were also made for the first annual meeting to be held February 17 and 18, 1956, at the Conrad Hilton Hotel, Chicago, Illinois.

Trends in Federal Highway Aid to Cities

1934—First limited use of federal funds for urban areas authorized.

1941—First use of federal funds authorized for surveys, plans and advance engineering in cities. Considered a turning point for many state highway departments in planning for urban highway construction.

1944—Funds earmarked for the first time for strictly urban use. Federal aid urban category set up and \$125 million authorized for each of the next two years. Use of federal funds authorized for the first time to purchase right-of-way on same basis as matching aid for construction.

First authorization for highly populated states to spend secondary road funds in urban areas.

1950—First authorization for use of federal funds to retire highway bond issues.

1954—First authorization for states to use urban funds for secondary roads within urban areas. Shifting of up to 10% of funds in one category to another authorized.

1955—It was proposed that the federal government:

1) Assume financial responsibility for the National Interstate System, including the 4,346 miles within cities and the 2,200 miles not yet designated, but which will probably be added as urban routes or by-passes.

2) Require state highway departments to establish urban highway units to administer state and federal aid funds for cities.

3) Guarantee state and city bond issues for urban street and highway work.

4) Increase federal aid for urban primary routes.

What's New in Equipment and Materials

Reader Service Coupon on Page 14

Truck Mixers Have Reduced Weight

Characteristics of the latest type Jaeger standard Model "D" truck mixers, announced by the Jaeger Machine Co., Columbus 16, O., are shortened center of gravity and reduced weight, 3-speed transmission with single lever control, and a complete choice of optional equipment to fit local conditions and plant requirements. Standard sizes, as truck mixers, range from 8½ cu. yd. down to a 3½ cu. yd. model which will haul 3 to 3½ yd., legal payload on single axles or 4 to 4½ yd. legal payload on lightest tandem axle trucks.

Jaeger's 3-speed transmission offers a range from 2 rpm drum speed at 1000 rpm engine, for discharging into wheelbarrows, up to 17 rpm at 2000 rpm engine, meets all operating requirements at efficient engine speeds. It is single lever operated, with automatic brake, and offers optional choice of hydraulic reversing or automotive type forward-reverse drive, both of long proved design.



Jaeger Model D Truck Mixer

Improved open-end loader has enlarged throat to take full advantage of the new 17 rpm drum charging speed. 25% larger discharge blades facilitate faster charging as well as discharging and prevent spillage from full mixer loads in transit. The Jaeger trouble-free sealed end loader, equipped with grout-proof grease seal maintained by built-in pressure lubrication system, is also offered as optional equipment on all models.

For more information circle 127 on Service Coupon Page 14 and mail now.

Two New 18 Yd. Euclid Scrapers

Euclid Division of General Motors Corp., Cleveland 17, O., is now in production on two new overhung engine type scrapers. Each has a struck capacity of 18 cu. yd. and utilizes Allison torque-matic drive consisting of torque converters and semi-automatic transmission.

Torque-matic drive completely eliminated clutching and permits the operator to change from one speed range to another under full power. It provides a constant,

smooth flow of power to the drive wheels and automatically provides the power needed for varying conditions of loading, hauling, and dumping. Both of these new scrapers are equipped with No-Spin differentials to provide maximum traction by directing full torque to the drive

wheel with the best footing.

The Model S-18 is powered by a 300 H.P. engine and has 27.00 x 33 tires. The Twin-Power Model TS-18 scraper has two 194 H.P. engines — one driving the tractor wheels and the other providing power to the rear wheels. Full 90° steer permits both models to make 180° turns in 35 ft. or less.

With 4-wheel drive and a total of 388 H.P., the TS-18 is stated to have the power and traction required for self-loading in practically any material and for fast travel speeds on steep grades and difficult hauls. Since it does not require a pusher, this scraper has extremely good versatility and on many jobs is actually a one-man earth moving crew.

MORE THAN

80%

OF ALL PAVED ROADS
ARE NOW SURFACED
with

ASPHALT

CUMMER
BATCH-TYPE
ASPHALT
PLANTS.....

CONSISTENTLY PRODUCE RECORD
TONNAGES WITH LESS DOWN-TIME

You can't beat the actual experience of "old hands" who have been operating Cummer Asphalt Plants for years when it comes to telling the real story behind Cummer equipment.

Such an "old hand" is Mr. Henry W. Jenkins, Vice-President of the Savannah Asphalt Company of Georgia. Mr. Jenkins says, "Our Cummer Portable Asphalt Plant—shown in the picture above—is rated at 60 to 70 tons per hour capacity. It's been delivering that in the three years we've owned it, and we're still surprised at how little we've had to shut down for repairs and replacements. The way we figure it, ruggedness and efficiency are built right into these Cummer Plants."

Cummer Asphalt Plants are batch-type complete with all motors and starter switches and all moving parts are individually motor driven.

Write now for your copy of the fully-illustrated Cummer catalog giving complete specifications on all plants and accessories.



THE F. D. CUMMER & SON CO.

1827 EAST 18th ST. • CLEVELAND 14, OHIO

... for more details circle 192, page 14

All operations of bowl lift, apron and ejector on these 18 yd. scrapers are independently controlled by means of hydraulic lever action — the same design and components that have proved their efficiency and ease of operation in other Euclid scrapers.

For more information circle 128 on Service Coupon Page 14 and mail now.

Portable Washing Plant

A new portable washing plant, Model 869, announced by Universal Engineering Corporation, 625 C Ave., N. W., Cedar Rapids, Ia., is stated to be the largest portable washer of its kind. It was designed to handle the largest capacity of other Universal crushing equipment. The new product has a 36 in. diameter, 25 ft. long double-screen, fine material washer with a 6 ft. by 20 ft. 3-deck screen.



Universal Model 869 Portable Washing Plant

Apparatus Measures Flexible Pavement Deflection

The Benkelman beam apparatus, announced by Solitest, Inc., 4711 W. North Ave., Chicago 39, Ill., is a simple and accurate device for measuring the deflection of flexible pavements under the action of moving wheel loads. This new apparatus was originally developed by the U. S. Bureau of Public Roads for use on their test road projects. The Benkelman beam apparatus can be used both as a research instrument or to check design criteria in the field on road test sections or actual highway construction.

In operation, the long probe beam is placed in position to pick up pavement deflections between wheels or adjacent to the tires of the test vehicle. The 12 ft. aluminum probe beam has a ball bearing pivot support to reduce rotational friction. The apparatus is supported on a hardwood maple stand. The dial indicator which measures the reflected deflection is mounted in this stand. The beam device is provided with levelling screws and an adjustable rear support. The apparatus is completely self-contained. The lightweight and simple design make it easily portable in the field and easy to operate.

For more information circle 129 on Service Coupon Page 14 and mail now.

New Design For Diesel Engine

A number of new design features have been incorporated into the diesel engine, including a new block, crankshaft, connecting rods, pistons and head. A more accurate valve train gives better engine operation with fewer adjustments needed. Hydraulic valve lifters keep the valves in perfect adjustment, reducing maintenance costs. Speeds for the DW20 (Series E) range from a low of 2.8 mph to a high of 32.1 mph; on the DW21 (Series C) from a low of 2.3 mph to a high of 20.5 mph.

To better utilize the rugged strength and the additional power built into the new DW20 (Series E) and the DW21 (Series C) tractors, Caterpillar has designed two new matching scraper units — the No. 456 scraper for the DW20 (Series E) and the No. 470 scraper for

the DW21 (Series C). These scrapers feature the exclusive Caterpillar "low-bowl" design. Wider and longer bowls increase the capacity to 18 yd. struck and 25 yd. heaped.

A new high lift apron has been developed, giving faster, more positive material ejection under all conditions. Higher ground clearance has been built into the scrapers to give them more workability under extremely soft conditions and over rough terrain. The same wide base 29.5 - 29 tires that appear on the new tractors are standard equipment on the "lowbowl" scrapers to give better flotation.

For more information circle 130 on Service Coupon Page 14 and mail now.

New Diesel Weighs 9.2 Lb. per HP

A new lightweight, 175 HP Turbodiesel has been announced by Cummins Engine Co., Inc., Columbus, Ind. This new Turbodiesel, designated the JT-6, is a six cylinder, in-line type with 4½-in. bore, 5-in. stroke and displacement of 401 cu. in. Installed in a truck, the JT-6 engine weighs only 1,615 lb. or 9.2 lb. per horsepower. The JT-6 Turbodiesel weighs 800 lb. less than other Cummins diesels of equivalent horsepower, and is

comparable in weight to gasoline engines of similar power.

Turbocharging is the key to the high horsepower available from this small engine. The JT-6 utilizes the normally wasted energy of the exhaust gas to create added power. This is accomplished by piping the exhaust through a turbine which is one element of the turbocharger. Expansion directs the exhaust gas against the turbine blades causing the wheel to rotate at high speed. A centrifugal impeller, mounted on the same shaft, but in a separate housing, draws fresh air and blows it into the intake manifold and cylinders under pressure. More weight of fresh air is forced into the cylinders and a greater quantity of fuel can be burned completely. This creates more power at the flywheel. The JT-6 develops 50 percent more power than the naturally-aspirated model.

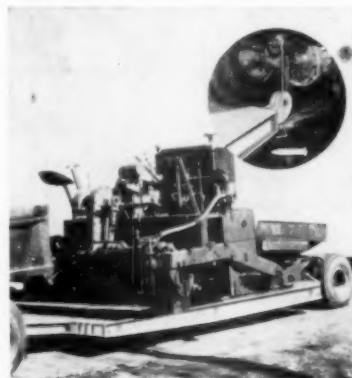
For more information circle 131 on Service Coupon Page 14 and mail now.

Black Top Paver Hauler

A new front loading low-bed trailer, designed especially to facilitate fast, clean transportation of black top pavers, rollers, etc. has been announced by La-Crosse Trailer Corp., LaCrosse, Wis.

Employing a self-contained power system with a special sheave-type hitch and simple cable lift arrangement, the new Model LXP-14 can readily be operated behind any standard truck, regardless of whether or not the truck has a hoist. A motor-driven hydraulic pump and ram, located underneath the trailer bed, actuates the cable which lowers the trailer platform to 7 in. height, for loading or unloading over front end. During this operation, the hoist cable is detached from dead-end hitch on rear of truck and swivel hitch on trailer is turned so it lies flat on the ground.

The new trailer is available in two models, 8 and 14-ton capacity. The 8-ton unit has an 8 ft. x 13 ft. load surface, with four 7:50 x 15 12-ply tires, and weighs approximately 3600 lb. The 14-ton model has an 8 ft. x 16 ft. deck, carries four 10:00 x 15 14-ply tires, and weighs around 5500 lb. Both have a platform height of 20 in. Complete lifting or lowering takes about 5 minutes.



Model LXP-14 Low-Bed Trailer

For more information circle 132 on Service Coupon Page 14 and mail now.



Schramm's Rotadrill on Pneumatractor

Drill Rig and Tractor Compressor

Designed to replace a 315 portable compressor and a wagon drill, the combination here pictured is recommended by its producer, Schramm, Inc., West Chester, Pennsylvania, for sinking shot holes or blast holes in quarries and construction jobs, water well drilling, core drilling and exploratory work, and for use on barges for submarine, channel, swamp and marsh drilling. Hole sizes range from 3 in. to 4½ in., with drill pipes available for each. Working depths extend to 500 ft.

The prime mover is a Schramm, Heavy Model, 125 c.f.m. "Pneumatractor" with rated speed of 10-12 m.p.h. Four hydraulic outriggers lift the machine free of all tire bounce.

Drill mast provides a 12-ft. feed for handling 10 ft. 6 in. drill joints. Drill can be operated at various angles for sloping holes. For transport the mast lies flat in a crotch, but generally it is left upright while moving from hole to hole on the same location.

Down feed is by hydraulic cylinder and double width chain. Drilling pressure equals the full weight of the rear of the machine — 10,000 lbs. approximately. Choice of fast or slow operation allows complete control of stabbing or break-out operations, permits bit or fluted reamer to drill itself out of cave-ins, etc., and provide fast operation for adding pipe or pulling drill string.

For more information circle 133 on Service Coupon Page 14 and mail now.

Gasoline Hammer Rock Drill

An improved self-contained gasoline hammer rock drill has been added to the line of power tool equipment of Syntro Co., 384 Lexington Ave., Homer City, Pa. It is stated this improved model gasoline hammer rock drill, the Model RD-55, can drill to the depth of 13 ft.

at a rate of approximately 2 ft. per minute when using Syntro hollow drill steels with carbide tips. In addition to providing automatic rotation of the drill steels, air compressed by the reciprocating hammer or striking piston will blow the dust and cuttings out of the hole. This prevents jamming or sticking of the

drill steel in the hole. Three sets of hollow carbide drill steels are available for this new model. Short sets use 2, 4 and 4 ft. steels with 1-3/16 in. to 1-3/8 in. diameter bits. The long sets uses 8, 10, and 13 ft. steels with 1-3/16 in. to 1¼ in. diameter bits.

For more information circle 134 on Service Coupon Page 14 and mail now.

Two-Wheel Hydraulic Scraper

A new two-wheel hydraulic scraper which has been tested and approved by International Harvester Co., for mounting on its "300" utility tractor has been announced by Shawnee Manufacturing Co., 1947 N. Topeka Ave., Topeka, Kan. The scraper has a capacity of 5/8 yd. and is hydraulically controlled from the driver's seat. The 66 in. wide cutting blade extends beyond the wheels and sides of the scraper. The unit uses two 600x15 tires. It weighs approximately 900 lb.



Shawnee 5/8 cu. yd. Scraper

For more information circle 135 on Service Coupon Page 14 and mail now.



PORTABLE ASPHALT PLANT

MODEL L-8, 10-15 TON CAPACITY



Stationary Plants L-12 and L-25, 15-30 ton capacity.

A COMPLETE ASPHALT PLANT ON ONE CHASSIS... DRYER, MIXER, HEATING KETTLE. Low in cost, small enough to tow, BIG enough to produce HOT mix, (or any other bituminous mix) for drive-ways, parking lots, street maintenance, etc. Equipped with 50 HP LeRoi engine, air operated gates for one man control, divided compartment, reciprocating feeder for proportioning aggregate. Available as stationary plant with 30 HP electric motor.

Write for catalog and name of nearest dealer.

White MANUFACTURING COMPANY

ELKHART 20, INDIANA



Pettibone Speedall Tractor Shovel on a Rugged Job

Tractor Shovel

Designed for the most rugged applications the new Pettibone Speedall tractor shovels with speedmatic power shift transmission are claimed to be finding increased application in those fields formerly dominated by heavy crawler equipment.

The extra heavy duty power train and extra rugged construction of the new Speedall tractor shovels are built to withstand the pounding and punishment of the heaviest material handling operations including pit and quarry work. Yet with all this ruggedness, these machines are stated to offer a new concept of mobility and flexibility to the operator.

Speedmatic power shift transmission, Speedall torque converter, 17 to 1 planetary drive axles and Speedall power steering are stated to make this tractor shovel a real profit maker on the hard tough jobs.

The new Speedall tractor shovels are available in three sizes with 1½, 1¼ and 2½ cu. yd. struck capacities. Each Speedall model is stated to be characterized by the highest and longest bucket reach in its field and each is available with gasoline or diesel engine. A number of custom attachments are available including snow bucket, lift fork, crane hook, snow plow and bulldozer blade.

A new bulletin fully describes these new tractor shovels. A copy is available on request without obligation. Write to Pettibone Mulliken Corporation, 4736 West Division St., Chicago 51, Ill.

For more information circle 136 on Service Coupon Page 14 and mail now.

Hydraulic Frameless Dump Trailer

A new "Frameless" dump trailer has been announced by Anthony Co., Stretor, Ill. This is known as the Anthony Teleramic frameless dump trailer. When dumping a load, the entire front end of the trailer is lifted by a single hydraulic telescopic cylinder mounted on the tractor fifth wheel coupling. In raising or lowering, the trailer body pivots around the rear wheels, and during this cycle,

tubular stabilizer arms, pinned both to the hoist-fifth wheel and the trailer body, gives added support for a variety of loads and working conditions. The advantage of this new dump trailer design is that additional legal payloads up to 2000 lbs. can now be hauled. The elimination of the conventional trailer frame and the use of only one front mounted head lift telescopic cylinder makes this weight saving possible. This frameless dump trailer is literally "a dump body on wheels." Hoist location over tractor driving wheels gives excellent traction for spreading.



Anthony Teleramic
Frameless Dump Trailer

For more information circle 137 on Service Coupon Page 14 and mail now.

Asphalt Supply Trailer Has Glass Fibre Insulation

A new asphalt supply trailer, placed on the market by Standard Steel Works, Inc., North Kansas City, Mo., is designed for rugged treatment on fast moving jobs. Glass Fibre insulation, in 1½ in. 2 in. or 3 in. thickness, is installed on all



Standard Steel Asphalt Supply Trailer

units hauling hot materials. The glass fibre is held in place permanently by heat treated cottonwood strips placed on the tank horizontally over previously installed studs. The strips are treated to withstand heat in excess of 600°.

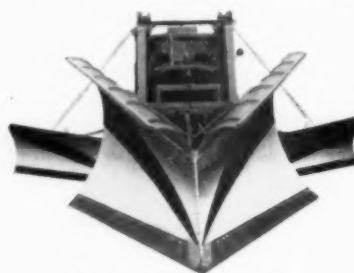
A variety of pump and engine combinations are available and either high or low pressure burner equipment can be furnished. Steam coils or fire tubes are also available. The burners are easily cleaned and the entire unit is built for top efficiency.

For more information circle 138 on Service Coupon Page 14 and mail now.

Three Snow Plows in One

The new triple 3-way snow plow, announced by Wausau Iron Works, Wausau, Wis., is said to be the first major snow plow improvement in years.

It can be positioned as a "V" plow, as a one way right hand discharge or as a one way left hand discharge. The cutting width in Vee position is 11 ft. 6 in.;



Triple 3-Way Snow Plow

cutting width in one way position 9 ft. 6 in.; cutting width in vee and one 12 ft. wing 17 ft. 6 in.; cutting width one way and one 12 ft. wing 18 ft. 6 in.; cutting width Vee and two 12 ft. wings 23 ft. 6 in. It is stated to be of revolutionary design, which in one complete package combines the plowing features of the one way, reversible and Vee plow, to meet the need for a high speed snow plow that can discharge snow to right or left as required by wind conditions existing on airports, boulevards and turnpikes. The Wausau design combines a thoroughly tested high speed one-way right hand moldboard and a left hand discharge moldboard to form a Vee and by hydraulic power from within the cab, shift this Vee, even while in motion, to right or left at 35 degrees, providing top performance.

For more information circle 139 on Service Coupon Page 14 and mail now.

Portable Concrete Batching Plant

One of the country's most portable, easily operated and highspeed concrete batching plants has been completed and successfully tested by Standard Steel Corporation, 5001 So. Boyle Ave., Los Angeles 58, Calif.

The new 150-ton capacity unit was delivered to Gunther-Shirley-Lane Co., Sherman Oaks, Calif., for installation near Yuma, Ariz., to supply dry and transit mix for the U. S. Bureau of Reclamation's canal and powerhouse project. The plant is the first of a complete

line of concrete construction equipment planned by Standard Steel.

Important features claimed for the new unit include complete portability; High-speed and accurate batching; ease of erection and disassembly; simplicity of operation; either automatic or manual; ruggedness; ease of maintenance and lowest cost per yard of concrete poured.

Designated as Model 4A-150P highway portable concrete batching plant, it can be knocked down into four component sections and transported on only three low-bed trucks. Its top and center sections and cement silo are within all state highway-prescribed maximum truck hauling dimensions of 9 ft. The cement elevator, completely assembled and ready for operation, also is within these confines.

Ability of the batch plant to produce 160 cu. yd. of dry mix, or 110 cu. yd. of transit mix per hour, with both cement and aggregates accurately weighed to meet all municipal, state and Federal specifications for concrete work, results from the following: there are separate weigh batchers for both cement and aggregates, plus large-size, positive-acting double clamshell gates throughout and a high-speed cement batcher feed screw equipped with accurate cut-off. Positive weighing of each aggregate, stored in the 150-ton, four-compartment bin measuring 32 ft. x 9 ft., is made by a Hardy direct reading dial scale, while cement is weighed in a separate hopper and gauged by a Hardymatic electronic scale. Controls, operated by one man, include the Hardy automatic with a three-batch selector system, easily set and changed. All dials and controls are in full view of



Model 4A-150P Highway Portable Concrete Batching Plant

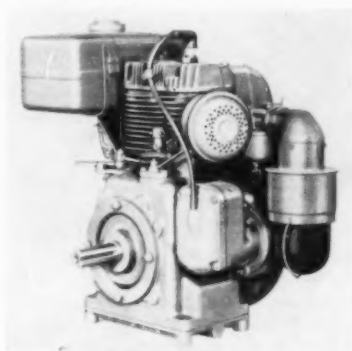
the operator, who can control gates to any position with a precision valve arrangement.

The unit has a vertical 550-bbl. cement batching and storage silo, which is filled with a vertical bucket elevator. Either an electric motor or gasoline engine can be used to run both the elevator and the screw-type feeder, operated off a chain drive.

For more information circle 140 on Service Coupon Page 14 and mail now.

2.3 to 5.6 HP Engine

In the light-weight 4-cycle, heavy-duty engine field, Wisconsin Motor Corporation, Milwaukee, Wis., has announced a new engine which will represent a substantial increase in maximum horsepower over the single cylinder Model ABN engine which it supersedes. The new engine, designated as the "Model ACN," heads up the Wisconsin line as the smallest engine in a current series of 12 models, rated from 5.6 to 38 h.p. (maximum power output.)



New Wisconsin Engine

The Model ACN has a piston displacement of 14.88 cu. in., and is designed to operate within a speed range of 1600 to 3600 rpm., delivering from 2.3 to 5.6 h.p., with a torque curve of 92 to 204 inch-lbs.

Like all Wisconsin air-cooled engines, the Model ACN is equipped with tapered roller main bearings at both ends of the crankshaft and gear-driven high tension magneto mounted on the outside of the engine and equipped with an impulse coupling for easy starting at low cranking speeds. Positive lubrication is provided by a pump-circulated splash system and the piston is equipped with four rings.

For more information circle 141 on Service Coupon Page 14 and mail now.

Light Duty Truck Can Travel Cross-Country

A new four-wheel drive International light-duty truck, model R-120 (4x4) has been introduced by the motor truck division of International Harvester Co., 180



Model R-120 (4x4) Truck

North Michigan Ave., Chicago 1, Ill. Gross vehicle weight rating of the new truck is 7,000 lb. It is offered in four wheelbases between 115 and 134 in., and is powered by the high torque 108-HP International Silver Diamond 220 engine. The Silver Diamond 240 engine, developing 131 HP, is optional. A design feature is the minimum body and step height, comparable with that of a standard truck.

A selection of pickup and stake bodies, as well as a utility body, is available. Optional tires for high ground clearance or for added flotation are offered.

This new International can be operated on hard-surface roads as a conventional rear-drive truck, or, with front axle drive engaged, can travel cross-country fully loaded in mud, sand or snow.

For more information circle 142 on Service Coupon Page 14 and mail now.

Sidebooms for Tractors

A complete new line of sidebooms matching International Harvester's new line of tractors has been announced by Superior Equipment of Bucyrus, O. The complete series consists of six models — from the PBI-9A to the PBI-241BH. In the accompanying illustration they are (left to right): PBI-241BH; PBI-181BH; PBI-181A; PBI-141A. These, in turn, are designed for International Harvester tractors TD-24 to TD-9.

New features in this Superior line are the bottom hinged, hydraulic, extendable counter-weights operated and powered by a combination pump and valve tank unit. Former lifting capacity range was between 16,000 lb. (on the PBI-9) and 92,000 lb. (on the PBI-24C). The upper limit is now 110,000 lb. capacity on the PBI-241BH 4 radius.

For more information circle 143 on Service Coupon Page 14 and mail now.



New line of Sidebooms for International Harvester's New Line of Tractors



Goodyear Tool for Changing Big Tires

Hydraulic Tire Changing Tool by Goodyear

A new hydraulic tire changing tool, termed an "outstanding development" in reducing costly down-time for big earth-moving vehicles, is announced by the Goodyear Tire & Rubber Company.

Known as the TO-100, this tool is the only portable hydraulic tire changer applicable to all makes and designs of rims for tubeless or conventional tires. It was designed by Goodyear primarily for the new tubeless earthmover tire and rim assemblies recently introduced.

This new tool is said to be ideal for standard equipment on construction job service trucks. It can be used on the job anywhere for changing or mounting tires, with minimum time and labor.

Featuring simplicity of construction and operation, the TO-100 consists of

three parts — frame, ram and hydraulic pump. The steel jaws of the frame are fastened to the rim of the vehicle (Fig. 1) then ram is placed in frame (Fig. 2) with the pointed tip or spade of ram inserted between tire and the rim flange. Pressure is then applied by means of the pump. This forces the spade downward, thus prying the tire bead away from the flange and loosening it from the bead seat.

A set of six metal spacers is included with the tool assembly. The spacers are used in pairs (photo, Fig. 3) to hold tire away from flange, while operator loosens the tire at other points until it is entirely off the rim. The TO-100 may be purchased from Goodyear rim distributors or authorized dealers.

For more information circle 144 on Service Coupon Page 14 and mail now.



1. In operating the Goodyear TO-100 tool, tighten securely the adjusting screws at bottom of tool's jaws. Set hand screw against lock ring and adjust until jaw assembly is in right angle position to plane of flange.



2. With spade tip down and ram in retracted position, insert spade and ram assembly between open sides of frame. Place spade tip between tire bead and rim flange. Lift ram until trunion engages frame shoulder support and move stop screw into support ram.

Track Guiding Guards for Cat. Tractor

Caterpillar Tractor Co., Peoria 8, Ill. has announced that track guiding guards are included in the standard specifications of all D8 Tractors. These guards keep the idlers and sprockets free of rocks and debris and tend to guide the track onto the rollers and sprocket. They are especially suitable for hillside operations. The track guiding guards consist of three heavy plates welded to the underside of each track roller frame. A guide is located on each side of the idler and on the outer side of the sprocket. A new heavy-duty track roller guard attachment replaces the one presently listed in the D8 Tractor price list. This new guard group, which is shorter in length, is adaptable only to D8 tractors with the track guiding guards.

For more information circle 145 on Service Coupon Page 14 and mail now.

Pile Driver Hose

Announcement of a new, extremely flexible pile driver hose for the construction industry, has been made by R. E. Chapman, manager, hose sales department, Goodyear Tire & Rubber Co., Akron, O.

Called Flexsteel pile driver hose, its high degree of flexibility has been demonstrated in both laboratory and field tests conducted jointly during the past 18 months. The improved hose is designed to give longer work life.

Produced in 1½-in., 2-in., and 2½-in. sizes, the hose is equipped with heat-resistant tubes and covers. The tubes have "Built-in" resistance to oil as well as heat. The hose is constructed of two braids of high-strength, steel wire, with quality nylon breaker used over the second steel braid to provide better heat resistance.

For more information circle 146 on Service Coupon Page 14 and mail now.



3. Move to spot 90 degrees from first application (either direction) and repeat entire procedure. Continue repeating procedure 4 or 5 times until tire is freed from rim.

Hydraulic Truck Loader

A hydraulic truck loader that operates as a complete unit with one man and one machine has been announced by LoDaL, Inc., Norway, Mich. With a 3000 lb. capacity, it loads one truck or many. It has fast action that is stated to permit loading speeds up to 2 yds. per minute in heavy material. It fits most trucks from 1½ to 4 tons capacity, with special models for trucks over 4 tons. Simplicity of design and rugged construction, the LoDaL hydraulic truck loader makes the truck a complete working unit. The truck loads itself and in addition, the forward tilting bucket provides for loading other trucks.



LoDaL Hydraulic Truck Loader
For more information circle 147 on
Service Coupon Page 14 and mail now.

Forward-Tipping Bucket For Truck Loader

A new type hydraulic forward-tipping bucket now permits the Holmes-Owen truck loader of Ernest Holmes Co., Chattanooga, Tenn., to be used as a loading unit for other trucks. The bucket



Holmes-Owen Loader with
Forward-Tipping Bucket

was designed to perform two important functions: First, to improve digging and shoveling operations when the unit is used for self-loading; second, to permit the equipment to be used for loading other vehicles. Achievement of these objectives not only improves the loader's working efficiency but considerably broadens its use in the field of material handling. The bucket is hydraulically operated by controls which are located on the steering column.

For more information circle 148 on
Service Coupon Page 14 and mail now.

All-Steel Snow Fence

An all-steel snow fence that offers sand and dust as well as snow control is being marketed by Northfield Iron Co., Northfield, Minn. Called the Blizzard-Buster, it is stated the fence will pile snow twice the height of the fence.

Constructed of 26-gauge, galvanized, pressed steel sheet and tough, manganese-carbon steel angle posts 2 in. x 1½ in. x 1/8 in., a 3 foot high Blizzard-Buster fence slanted 5 to 7 degrees windward will, it is stated, stop more snow than an ordinary 4-foot lath fence. Slots at the ends of the rails are lined up and slipped over the retaining fingers on the posts. No tie or guy wires or stretching



Blizzard-Buster Along Minnesota State
Highway 218, South of Farmington

For more information circle 149 on
Service Coupon Page 14 and mail now.

are needed. Every section, in addition, is V-crimped for extra strength.

Standard Steel MODEL 55 Tandem Roller

1½ to 2½
TONS

for **ECONOMY...**
SPEED



**BUILT LIKE
THE BIG ONES**
**PERFORMS LIKE
THE BIG ONES**

Provides FLUSH CURB Rolling on Each Side

THE MODEL 55 ROLLER was designed to provide two important advantages: (1) Adequate compaction for patch rolling requirements and (2) Ideal roll dimensions for smoothing and finishing work. Ballasting is evenly distributed through the use of both steel and water ballast. Steel ballast is removable in 70# sections providing a wide choice of compaction ranges.

The Model 55 will roll to within 2 inches of wall or building on driver's side and to 4½ inches on opposite side. Eight inch ground clearance provides flush rolling adjacent to curbs. Automotive steering makes easy driving. Up-hoistered seat, safety seat rail, speed control, throttle and foot brake are of motor-car type — and water valve is in easy reach of operator. The maximum weight with all ballast is 4600#. Shipping weight is 3600#. Speed — from 1.75 MPH to 3.5 MPH



TRAILERIZED FOR EASY TRAVEL FROM JOB TO JOB

Photo above shows ease with which roller is loaded and unloaded from trailer. One man can easily lift and hook it to towing vehicle

Loading Ramp becomes end gate. Roller locks on trailer for safe travel at all speeds. Write for FREE Catalog and Prices



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10 LEADS TO BETTER, and BIGGER PROFITS! FASTER RESULTS



MACADAM DENSIFICATION. The Jackson Multiple Compactor consolidates granular soil sub-bases and base courses of sand, gravel, rock or slag in half the time required with equipment of other types.



PAVEMENT WIDENING. The Multiple Compactor can be quickly converted to provide in ONE PASS 100% of required density in granular soil sub-bases and rock courses in any widening project.



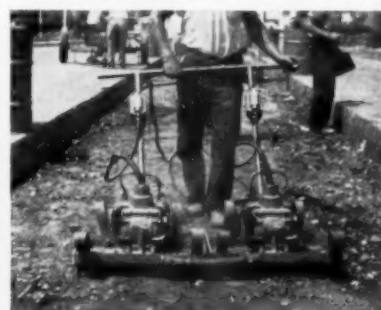
GRANULAR SOIL FILLS. The Multiple Compactor quickly achieves specified density, gets into places bigger, more expensive equipment cannot reach. Individual units can be detached, operated as manually guided compactors.



SOIL COMPACTION. Self-propelling, the JACKSON COMPACTOR, with 12" to 24" interchangeable bases, achieves specified density of granular soils in 8" to 10" depths at 2000 sq. ft. per hr. Perfect for bridge and pipe line fills, concrete floor sub-bases, etc.



BLACKTOP WIDENING & PATCHING. The same machine operated from power plant on auto-trailer with pickup for Compactor is most efficient means of blacktop pavement patching, paving walks, drives, etc. Will compact up to 2000 sq. ft. per hr. close to maximum density.

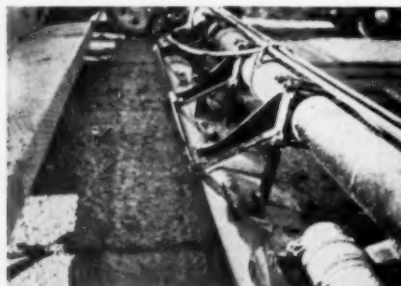


TWIN-UNITS — ONE OPERATOR. With a two-unit, side-by-side or tandem hookup of JACKSON COMPACTORS, one man can readily do the work of two, since the compactors are self-propelling and he has only to guide them.



CONCRETE VIBRATION FOR HIGHWAY AND AIRPORT PAVING

INTERNAL TYPE: super-powered, gives full width internal vibration through full depth of very thick slabs. Saves time, cement; provides greater density and compressive strength. Attaches to finisher or spreader.



SURFACE TYPE: does perfect job of vibrating all mixes in depths used on highway projects. The owner of a JACKSON Paving Tube can quickly switch from internal to external vibration, or vice versa, at minimum expense.

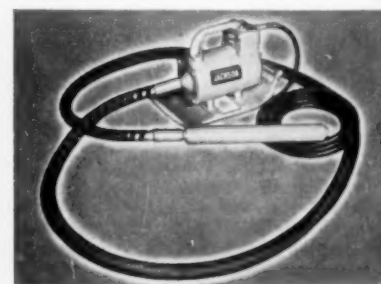
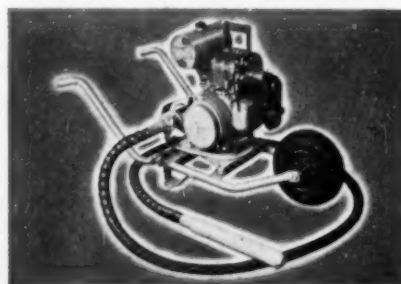


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LUDINGTON, MICHIGAN



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(Left); 6 H.P. engine-driven, flexible shaft vibrator. Excellent for both thin and thick sections. (Right); 2 1/2 H.P. electric vibrator (for light-socket operation). Handy as a pocket in a shirt, powerful enough to handle all general construction concrete vibration with shafts up to 28'.

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PRICE — \$35.00 EACH

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We specialize in new and used Army parts. Tarps, 17x40, \$30.00 each; tarps, 17x20, \$25.00 each, like new. New C. H. Fink snow plow, model 349SP; large and small fork lifts; large and small winches; 40 generator sets, 4 cyl. gas engine, 15KW DC, 28.5 volt, 2 wire, 2400 RPM, portable, Model C-16, (500 new truck heaters, \$5.00 each.)

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25% WITH ORDER — BALANCE C.O.D.

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Army Surplus & Vehicles
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Govt. Acquisition Cost \$140.00 Each

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Length 70", Width 40", Wheel Height 20 1/4", Road Clearance 12", 400x12 4-Ply Tires and Tubes, TARPS, Bog Ropes, Quick Detachable Drawbar.

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Shipping weight, Box of Two, 350#. Class 2 Freight
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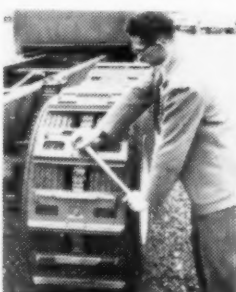
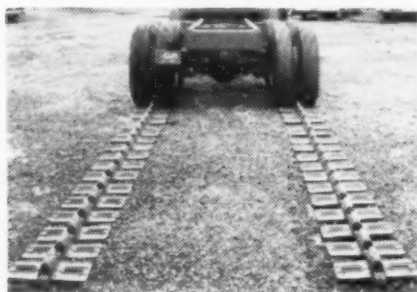
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9:00x20	\$264.00	\$432.00	\$432.00	\$456.00	\$456.00	\$480.00	\$480.00	\$480.00	\$504.00
10:00x20	\$264.00	\$456.00	\$456.00	\$456.00	\$480.00	\$480.00	\$480.00	\$504.00	\$504.00
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A-C Model HD7W with Hydraulic bulldozer, rebuilt and guaranteed.
Cat. Model D-8 Tractor, good condition w/ Cat. S8 bulldozer.
Cat. D-4 w/hyd Dozer. Like new.

Cat. D-4 with HT-4 hyd. loader — good condition.
Used AC Model D Grader. Good condition.
TD-18 w/cable dozer.
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1—Bucyrus-Erie 33B 1¼ yard Shovel front with 1½ Dipper, Wisconsin 6 Cyl. Engine.

1—Lorain SP414 Self Propelled Moto-Crane, 30' Crane Boom.

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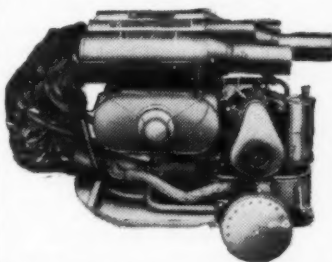
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One (1) Link Belt Model LS-52 Crane/Dragline, S/N
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McCarthy Hy-Wall Drill mounted on Chevrolet Truck.

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D-8 Caterpillar tractor with blade and
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... for more details circle 228, page 14

Manufacturers' Literature

Form Coating Produces Protective Film

A 6-page folder issued by Stonehard Co., 1306 Spring Garden St., Philadelphia 23, Pa.; describes Stonehard form coating, a scientifically developed liquid resin. It is stated the coating will not be "all soaked up" by wood forms, or "drain away" on metal forms. Only a predetermined portion penetrates wood forms, the major part cures to a solid surface film, producing a tough, protective coating.

For more information circle 150 on
Service Coupon Page 14 and mail now.

Facts and Figures on Highways and Heavy Construction

One hundred pages of information on highways, heavy-construction or other basic industries, is now available free on request in the 11th edition of Facts and Figures, the popular pocket reference booklet published by Pioneer Engineering Works, Inc., Minneapolis 13, Minn., subsidiary of Poor & Co., Chicago. The new Facts and Figures is packed with almost twice as much up-to-date factual data and information, gathered from a variety of sources for inclusion in one handy volume, as was contained in the 10th edition, published in 1950. Expanded perhaps more than others is the section on asphaltic materials and their uses. Among other subjects covered are aggregate specifications, crusher settings, feeder capacities, electrical data, earth-moving equipment formulae, screens, tank capacities, trigonometric functions, and standard gauges of wire — together with an excellent eight-page glossary of terms of the trade.

For more information circle 151 on
Service Coupon Page 14 and mail now.

Motor Grader

A comprehensive story of the engineering, design and performance features that are incorporated in the new Allis-Chalmers heavy-duty Forty-Five Motor Grader is told in the illustrated 8-page, 2-color catalog (MS-446) available from the Allis-Chalmers Manufacturing Co., Tractor Group, Construction Machinery Division, Milwaukee, Wis. Developments incorporated in the Forty-Five and in the new 120 h.p. Allis-Chalmers Diesel engine powering it, are described with the help of photographs and illustrations, which help to point up the versatility, efficiency and economy of this new heavy-duty unit. Features that provide maximum safety and comfort for the operator are also outlined, along with specifications and the standard and optional equipment that has been designed and engineered for the motor grader.

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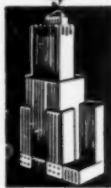
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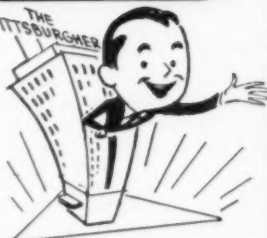
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150 HP. and 285 HP. Engines

A new 8-page bulletin describing Le Roi's industrial H540 and H844 V-8 engines has been published by the Le Roi Division of Westinghouse Air Brake Co., Milwaukee 1, Wis. The 3-color bulletin uses 40 halftones, charts, drawings, and diagrams to illustrate the advance design, performance, and economy of these two engines, which operate on gasoline, natural gas or L.P. gas. Engine specifications and applications are included.

For more information circle 152 on
Service Coupon Page 14 and mail now.

Wire Rope Slings

A new catalog issued by the Wire Rope Corporation of America, Inc., St. Joseph, Mo., features Wireco slings and fittings. The 80-page catalog illustrates and describes 54 sling types with accompanying capacity tables for each. The most commonly used fittings are also illustrated with capacity tables.

For more information circle 153 on
Service Coupon Page 14 and mail now.

Calcium Chloride for Ice Control

The Calcium Chloride Institute has prepared and will send on request a copy of their Manual IM-1 "Calcium Chloride for Ice Control." It contains recommendations for treating and storing abrasives, spreading abrasives and direct application of calcium chloride in ice control operations. The manual also contains helpful tables and charts on skid test data and melting action of abrasives. Write the Calcium Chloride Institute, 909 Ring Bldg., Washington 6, D. C.

For more information circle 154 on
Service Coupon Page 14 and mail now.

Diesel-Powered Crawler Tractor

The technical and operating story of the Allis-Chalmers 45 drawbar h.p. HD-6 diesel-powered crawler tractor is available from the Construction Machinery Division, Tractor Group, Allis-Chalmers Manufacturing Co., Milwaukee, Wis. In a new 2 color catalog (MS-461) engineering, design and performance features of the new HD-6 are explained with the help of many photographs and illustrations which are also used in reviewing the new Allis-Chalmers diesel engine which powers the tractor. In addition to specifications, the new catalog lists the full line of matched equipment and accessories that have been engineered to the HD-6 and increase its versatility, efficiency, and economy, and provide maximum safety and comfort for the operator.

For more information circle 155 on
Service Coupon Page 14 and mail now.

Tractors and Scrapers

Descriptive literature (Form No. 31-690) on the new, 300 HP DW20 and DW 21 Tractors and accompanying Low-bowl-designed Nos. 456 and 470 Scrapers is available from the Advertising Di-

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vision, Caterpillar Tractor Co., Peoria, Ill. The Lowbowl design — a new conception in the contour of the bowl — increases capacity and allows faster and easier loading. The two scrapers now have capacities of 18 cu. yds. struck and 25 cu. yds. heaped. The tractors' new additional features are an increase of 10% in rimpull, a turbocharged engine with optional direct electric or gasoline engine starting, and wide-section tires that give increased ground contact and provide less rolling resistance.

For more information circle 156 on
Service Coupon this page and mail now.

Concrete Pipe Forms

A new catalog on their complete line of equipment for manufacturing concrete pipe has been announced by Quinn Wire & Iron Works, Boone, Iowa. The company manufactures concrete pipe forms in all shapes, sizes and lengths for the production of standard and special types of culverts, sewers, manholes, septic tanks, cattle passes, etc. In addition, this company makes bending rolls for shaping wire fabric used in the production of reinforced concrete pipe. Machines for large scale production of medium and larger sizes of concrete pipe are also manufactured by the company. The catalog also contains pages of valuable information for the concrete pipe manufacturer. These include an outline of the methods of manufacturing concrete pipe by the wet and the semi-dry

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FREE! Our new catalog illustrates our complete line of equipment. Contains pages of valuable tips for the concrete pipe manufacturer. Write today for your free copy and estimates.

Quinn WIRE & IRON WORKS
BOONE, IOWA



... for more details circle 222, page 14



"Best machine of its kind I've ever operated"

Take a veteran operator's word for it—there is nothing like ARROW MOBILE HYDRAULIC HAMMERS. They make light work of those heavy tamping and pavement breaking or cutting jobs. They deliver up to 8,000 foot pounds per blow. They can be moved from job to job under their own power. Tower "breaks" to comply with all highway regulations on vehicle heights and allowable overhang. Exclusive creeper drive eliminates skips or overlapping blows.

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... for more details circle 180, page 14

processes; production suggestions and a simplified means of pricing either plain or reinforced pipe; the standards set up for the production of reinforced culvert and sewer pipe; and the comparative capacities of corrugated metal culverts and concrete pipe culverts.

For more information circle 157 on Service Coupon Page 14 and mail now.

Wire Rope Blocks and Fittings

Sauerman Bros. Bulletin No. 163 shows features of their Durolite blocks in sizes from 6 in. to 42 in. A new riggers block with an extra wide sheave groove permitting use of larger cable than the standard block of same diameter is also described. Bulletin No. 164, "Wire Rope Fittings," contains tables, drawings and ordering information for open and double wedge sockets in rope sizes from 3/8 in. to 2 in. Sauerman Bros., Inc., Dept. R-18., 620 S. 28th Avenue, Bellwood, Illinois.

For more information circle 158 on Service Coupon Page 14 and mail now.

Data Sheet on Water Hose

A new, illustrated data sheet on its line of water hose has been issued by the B. F. Goodrich Co., Industrial Products Division, Akron, Ohio. The data sheet describes special hose constructions available for such specific uses as wetting dust in coal mines; long length heavy duty hose for construction projects, road building and other high pressure uses; pile-driving operations, hydraulic bank grading, stripping and sluicing; and for general service in paper and pulp mills. Sizes, pressures, coupling information and construction features for each type of hose are listed in data sheet.

For more information circle 159 on Service Coupon Page 14 and mail now.

Truck Crane

A 12-page bulletin showing illustrations and specifications on the Unit Challenger Model 510 truck crane is now available from Unit Crane & Shovel Corp., Milwaukee 14, Wis. This bulletin (C-800) describes in detail such features as hydraulic actuated clutch control, full floating trunion mounted taper drums, self-aligning hook shoes and force feed lubrication, plus many other features incorporated in this new Model 510 3/4 yd. machine.

For more information circle 160 on Service Coupon Page 14 and mail now.

Trencher for Wheel Tractors

A 4-page bulletin of The Earth Equipment Corp., 2036 Sacramento St., Los Angeles 21, Calif., describes the new Everett Trencher designed for use on Massey-Harris — Ferguson 35 tractors or the new series 600 and 800 Fords. Cutting width is 12 in. to 18 in.; maximum depth of cut is 42 in. Operation is by power take-off from tractor. A V-belt safety slip stops the bucket line when obstructions are hit. Raising and lowering is by built-in hydraulic system. Specifications occupy one page of the bulletin.

For more information circle 161 on Service Coupon Page 14 and mail now.

Tractors and Scrapers

Descriptive literature on the new, 300 HP DW20 and DW21 tractors and accompanying lowbowl-designed Nos. 456 and 470 scrapers has been made available by Caterpillar Tractor Co. The two scrapers now have capacities of 18 cu. yd. struck and 25 cu. yd. heaped. The tractors' new additional features are an increase of 10% in rimpull, a turbocharged engine with optional direct electric or gasoline engine starting, and wide-section tires that give increased ground contact and provide less rolling resistance. This publication is available by writing Advertising Division, Caterpillar Tractor Co., Peoria, Illinois. Ask for Form No. 31690.

For more information circle 162 on Service Coupon Page 14 and mail now.

Diesel-Powered Crawler Tractor

Engineering, design and performance features of its new HD-21 diesel-powered crawler tractor are described in the new 16-page 2-color catalog (MS-457) available from the Allis-Chalmers Manufacturing Co., Tractor Group, Construction Machinery Division, Milwaukee, Wis. Many photographs and illustrations are included as pictorial aids in telling the HD-21's technical and operating story, and to describe the new 204 net engine h.p. Allis-Chalmers Diesel engine which powers the tractor. Also listed are the matched equipment and the complete line of accessories designed for the HD-21 to provide greater versatility, efficiency and economy, as well as maximum operator safety and comfort.

For more information circle 163 on Service Coupon Page 14 and mail now.

Concrete Curing and Protection

A brochure is available from American Sisalkraft Corporation, Sales Promotion Department, Attleboro, Mass. on the "Curing and Protection of Concrete" which explains the definition, effects and method of concrete curing. In addition, the results of exhaustive tests using our curing method and materials are shown.

For more information circle 164 on Service Coupon Page 14 and mail now.

Wire Rope Slings

CF&L Dura-grip wire rope slings are featured in a new bulletin prepared by the Wickwire Spencer Steel Division of The Colorado Fuel & Iron Corporation, 575 Madison Ave., New York, N. Y. The bulletin illustrates various assemblies for which the slings can be used, and gives a complete listing of dimensions and rated capacities.

For more information circle 165 on Service Coupon Page 14 and mail now.

3-Way Snow Plow

What is said to be the first major snow plow improvement in years is described in a new catalog issued by Wausau Iron Works, Wausau, Wis. The plow, referred to as the new "Wausau" Triple Threat, is described in detail and complete specifications are given.

For more information circle 166 on Service Coupon Page 14 and mail now.

Hose Couplings and Fittings

A new data sheet on hose couplings and fittings has been issued by the B. F. Goodrich Co. Industrial Products Division, Akron, O. Among couplings illustrated and described with complete specifications and recommended uses are: short and long shank common couplings, barbed insert, Quick-acting, Bar-way reattachable, interlocking high pressure, Permalock type D and Type 68 reattachable couplings. Other methods of joining hose, as described in the new data sheet, include Punch-Lok clamps, menders and nipples; inserted pipe nipples, combination nipples, built-in nipples, "Flexseal" hose joint, flanges and integral flanged hose end.

For more information circle 167 on Service Coupon Page 14 and mail now.

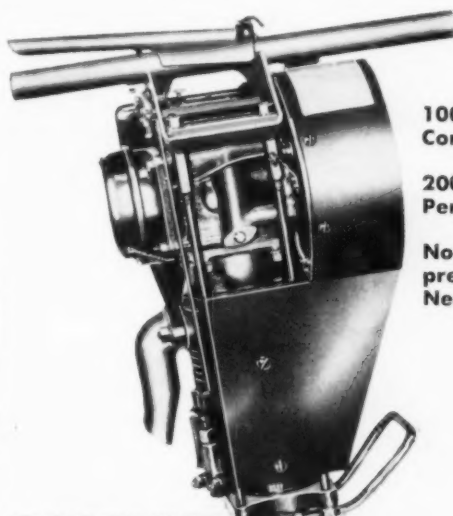
Power Unit

A new 8-page, 2-color catalog (MS-455) which gives the design, engineering and performance story of the 4-cylinder, 60 h.p. Allis-Chalmers W-226 power unit is available from the Tractor Group, Allis-Chalmers Manufacturing Co., Milwaukee, Wis. Included in the catalog are specifications, cut-away views of the power package and many of its components; photographs of the fan to flywheel unit, the open-style unit and the standard unit available to meet the specific installation requirement of the user; a listing of the special and extra equipment that increases the versatility and use of the W-226.

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Down time is no joke.

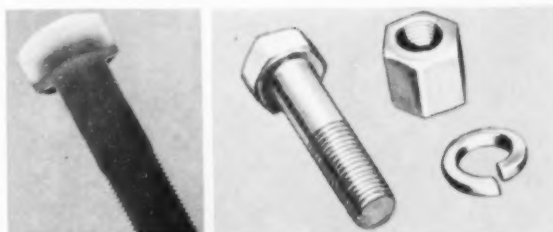
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Caterpillar Tractor Co., Peoria, Illinois, U.S.A.



On the surface, CAT® hardware looks like ordinary kind. But etched cross section of newly designed track bolt (left) shows depth of special "Hi-Electro" hardening penetration in bolt head.

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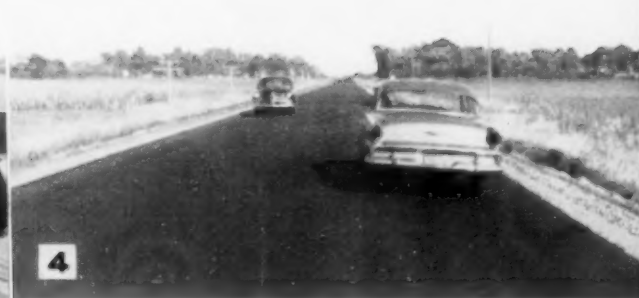
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Building Good Roads

with low-cost gravel
and Texaco Asphalt



PHOTOGRAPHS

1. Road-mixing machine picks up gravel from windrow, blends it uniformly with Texaco Slow-curing Asphaltic Oil and deposits mix in another windrow.
2. A power grader is used to spread the asphalt-gravel mix over the full width of the road to the desired thickness.
3. Multiwheel rollers, as well as a conventional steel wheel roller, were used to compact the Texaco Asphalt wearing surface.
4. Completed Todd County road illustrates results obtainable with low-cost gravel and Texaco Asphaltic products.

CONTRACTOR . . . Roland M. Starry
Long Prairie, Minn.

Any county or municipality favored with an ample supply of local gravel can build good roads at low cost by following the example of Todd County, Minn.

In the road project illustrated above, Todd County used inexpensive gravel both as a base and as the aggregate in a road-mix type of Texaco Asphalt wearing surface. The result is a highway capable of serving fairly heavy traffic for years, with an occasional bituminous seal coat.

The waterbound gravel base was laid in two courses to a compacted thickness of 4 to 6 inches. Following

this, Texaco Slow-curing Asphaltic Oil and gravel were blended uniformly on the base by mechanical mixer, spread by power grader and compacted to form a tough, waterproof surface 1½ inches thick.

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. . . for more details circle 243, page 14